PROCEEDINGS

of the

89th Annual Conference

of the

American Railway Bridge & Building Association

1984

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Proceedings of the

Eighty-Ninth Annual Conference

of the

American Railway
Bridge & Building
Association

Held at

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PROCEEDINGS

OPENING JOINT SESSION

Monday, September 24, 1984

The first Joint Session of the American Railway Bridge and Building Association and the Roadmasters' and Maintenance of Way Association of America was called to order at the Palmer House, Chicago, Illinois, on Monday, September 24, 1984 at 8:30 a.m., Mr. James Budzileni, President of the American Railway Bridge and Building Association presiding.

President Budzileni: Good morning. As President of the American Railway Bridge and Building Association and on behalf of Mr. H.V. Meek, President of the Roadmasters' and Maintenance of Way Association of America, I declare this the 89th Annual Conference of the American Railway Bridge and Building Association and the 96th Annual Conference of the Roadmasters' and Maintenance of Way Association of America to be open and in Joint Session. It is proper that we pause to ask for divine guidance and inspiration prior to commencing this conference. I would like to call upon Pastor Earl Ferguson of Deer Creek Christian Church in University Park, Illinois, who will deliver the invocation. Pastor Ferguson.

Pastor Ferguson: Shall we stand as we ask for God's blessing? Father in heaven, we invoke your divine and excellent blessing upon this great gathering, this conference. May the business of this day be conducted in the spirit of the greatest among us. We pray that the objectives of this conference might be realized, the end product might be a new desire to improve the quality of life of all Americans. Thank you for what the men gathered here have contributed already to that. We pray, Lord, that you bless the renewing of old fellowships and grant that we may develop new ones. We thank you for being our friend. Father, we are grateful for this free land, this land of opportunity; may we never take this freedom for granted. May we always be grateful to You as the source of life and for Your Word which is the inspiration for all of us in our dream. Forgive us our shortcomings and bless the sessions of this day is our prayer to You today. Amen.

President Budzileni: Thank you, Pastor Ferguson for your words of inspiration. We would be pleased to have you stay for all or part of our program, but we know that you have a busy schedule; please feel free to leave whenever you desire.

I join with President Meek in welcoming you to the first Joint Session of the two Associations. We sincerely hope you will enjoy your visit to Chicago and urge you to attend the sessions of this two and a half day conference. Please read the program carefully as it is full of excellent topics. Enjoy yourselves and partake of the hospitality extended by REMSA.

For the ladies, we have a very interesting program starting at 10:00 a.m. today with a visit to the Terra Museum, followed by a stop at the Baha'I House of Worship. Lunch will be at the Botanic Gardens, and there will be time to enjoy the rose garden, with a visit to the Japanese Tea Island, a tram ride through the park, and they will be able to spend some time in the gift shop. The tour will return to the hotel about 3:00 p.m.

Tomorrow, as there was today, there will be coffee and rolls served at the Pool Promenade on the Sixth Floor. At 1:30 p.m. there will be an in-house fashion accessory presentation in the State Ballroom on the Fourth Floor.

Now, I would like to introduce the officers and directors of the American Railway Bridge and Building Association who are seated at the head table. Those whose duties demand their presence elsewhere will be introduced at a later session.

Your officers are doing an excellent job of directing your Association and have put together another outstanding conference program. As I introduce each person, I ask that he stand, and remain standing. Please hold your applause until all have been introduced. Starting on my extreme left, Director B.T. Burns, Steel Bridge Inspector,

Atchison, Topeka and Santa Fe, Topeka, Kansas. Byron is chairman of B&B Committee for Equipment and also serves on the Resolutions and Ladies activities committees. He is the sponsor for Special Subject No. 2.

Director T.E. Kuhn, Bridge Construction Engineer, Missouri Pacific Railroad, St. Louis, Missouri. Tom is chairman of the Membership Committee and also serves on the B&B Material Committee, and is the sponsor for Special Subject No. 3.

Director R.A. Tallent, Process Engineer-Structures, Southern Railway, Atlanta, Georgia. Ray is the Chairman of the Advertising Committee and serves on the Necrology and B&B Equipment committees.

Director J.W. Davidson, Assistant Chief Engineer-Design and Structures, Burlington Northern Transportation Company, Overland Park, Kansas. Jim is chairman of the Necrology Committee and also serves on the Advertising, Registration and Special Features committees.

Junior Vice President J.T. Kapp, Projects Manager, Conrail, Philadelphia, Pennsylvania. John is Chairman of Special Subjects, and also serves on the Conference Program and Resolutions committees.

Junior Vice President D.A. Bessey, Assistant Chief Engineer-Structures, Chicago, Milwaukee, St. Paul and Pacific Railroad, Chicago, Illinois. Don is Chairman of Special Features Committee and also serves on the Conference Program and Membership committees. In addition, Don is Chairman of the Joint Association Committee.

Senior Vice President J.M. Williams, Supervisor Bridges and Buildings, Elgin, Joliet and Eastern Railway, Gary, Indiana. Jim is Chairman of the Conference Program Committee and serves on the Hotel Arrangements Committee and the Ad Hoc Budget Committee. You may now applaud.

(Applause.)

The remaining guests at the front table will be introduced at a later time.

Now I will turn the rostrum over to Mr. H.V. Meek, President of the Roadmasters' and Maintenance of Way Association of America. Mr. Meek.

President Meek: Ladies and Gentlemen, I join with President Budzileni to welcome you to this joint session of our two Associations. We certainly hope that your visit to Chicago will be rewarding and enjoyable. The committees of these two organizations have worked very hard in preparing the various presentations that will be given during the next two and a half days, and we feel that they will be of great benefit to you and your companies. We urge you to attend these sessions during this time. Please enjoy yourselves, meet with your peers, partake of the hospitality and expertise extended by REMSA.

I would like now to have you meet some of the fine officers who have so ably guided the Roadmasters' Association this past year. There are a number of other officers who could not be here at this time because of their duties attending to the affairs of this conference in another location in the building. Will these officers stand when their names are called and remain standing. Please hold your applause until all have been introduced.

On my extreme right:

Director Hugh J. Fuller, Track Supervisor, Chessie System, Indianapolis, Indiana.

Director John J. Swiderski, Regional Inspector Maintenance of Way, CN Rail, Edmonton, Canada.

Director Mike E. McGinley, Assistant Engineer-Maintenance, Southern Pacific, Houston, Texas.

Director John T. Smith, Division Engineer, Union Pacific, Stockton, California.

Director Lester H. Kelley, Regional Engineer, Seaboard System Railroad, Jacksonville, Florida.

Director Ray E. Snyder, Assistant Chief Engineer-Maintenance, Chicago and North Western Transportation Company, Chicago, Illinois.

Director Mike J. Marlow, Supervising Engineer of Tracks and Property, Elgin, Joliet and Eastern Railway Company, Joliet, Illinois.

Second Vice President, C.S. (Wick) Moorman, Division Engineer, Southern Railway, Greensboro, North Carolina.

First Vice President, Dave E. Staplin, Director of Planning and Valuation, Seaboard System Railroad, Jacksonville, Florida.

You may now applaud.

(Applause.)

Next, it gives me great pleasure to introduce a fellow who needs no introduction to most of you. This is a young fellow, he's 39 years old with curly blond hair. He started working for the Boston and Maine in 1947 as a chainman and they didn't like him very well so they kicked him out and sent him to the Army. He came back and went to school and graduated from the University of New Hampshire. He served as welding supervisor, track supervisor, engineer maintenance of way, and he's now the vice president of engineering on the Boston and Maine and chief engineer of the Maine Central. It gives me great pleasure to introduce Vinnie Terrill.

Mr. Terrill: I want to thank the Roadmasters' and Maintenance of Way Association of America and the American Railway Bridge and Building Association and the Railway Engineering Maintenance Suppliers Association for inviting us to attend this annual conference. I do have one complaint for Huburt Meek. I received my Roadmasters' membership paid up card and have it here in my wallet. Now I find that if I had been delinquent and waited a while and made some more interest on my money I could have paid late and received an attractive blue and white enamel finish commemorative pin. Huburt, I want my money back!

President Meek: You've got a pin coming!

Greetings From AREA

Mr. Terrill: Roadmaster President Huburt Meek and officers of the Roadmasters' organization, B&B President, Jim Budzileni and officers of the B&B Association, thank you for inviting me. Incidentally, Jim and Huburt drew lots to see who would invite me! I wasn't sure whether the winner got the pleasure or the loser got the job until I read the letter again. The last sentence of which I will quote, "Some time between 8:35 and 8:45 the members will be waiting to hear your words of wisdom." Do you detect, as I did, between the lines, "and waiting, and waiting, and waiting!" Oh well, sorry you lost, Jim.

Now we can get down to business. I would like to see a show of hands from any AREA members here. Okay. We seem to have a goodly amount in the audience. Right after my few words of wisdom we'll form a strike force to be led by Hubert Rose and his A-Team and Don Sartori, both ex-AREA presidents, and we're going to make our move. For my sake, fellows, wait until I get off the podium! On the more serious side of that issue, since Merwin Dick won't let it die, he's written another back page article on it, the AREA has problems enough, particularly with me around, that it does not wish to enjoin any other association. It was just two years ago when we had to take some hard financial steps to get our own house in order. I will say for the last time that I have never heard the subject discussed before Mr. Dick printed the so-called "rumor." I agree with President Meek's statement supporting the three independent organizations. I would like to comment on his quote. President Meek quoted a learned man as follows: "If you were to cut off one leg of a three legged milk stool which one would it be?" I don't intend to try to answer that question but as an ex-New Hampshire farm boy I can give you some advice: you'd better be holding on to something other than what I think you're holding on to when that stool goes down 'cause the cow ain't gonna like it one bit!

Presidents Budzileni and Meek, thank you for allowing me the time to bring Greetings from the American Railway Engineering Association in their eighty-fifth year. You do me a great honor. Last night Jim Budzileni asked me if I was a charter member. I looked that word "charter" up and it means that I've been a member for 85 years. You just heard Huburt this morning saying I was only 39. I hope that answers your question.

I wish to invite you all to our Mexico City regional meeting October 24 for all of our 22 committee chairmen, October 25, 26 and 27 for the program and sensational train ride and tour. Bring your ladies to enjoy the ladies' program and spend some of your money. I hate to admit it, but this should even top the AREA regional held in Danvers, Massachusetts, last Fall when so many of you supported us by your attendance. It is not too late to make reservations. We already have over 100 from the

United States and Canada to add to the 150 Mexican railroaders expected to be in attendance. See Lou Cerny, our Executive Director, he will take care of everything. He will even take care of your money.

While I am passing around thanks we must not forget to give a handful to fellow President Knox Kershaw. He and his wife incidentally had a baby girl, Courtney, just a very few days ago, and his wife had to stay and take care of Courtney so that Knox could get here. I also want to thank the fine REMSA organization which he leads. Thanks, Knox. Incidentally, your organization could not have chosen three finer members for this year's board of directors than Ken Ault, Jon Schumaker, and John Riley. They certainly help to maintain the dignity of REMSA's board.

With a look at the exciting program that the B&B and Roadmasters' Associations have put together you do not need any "best wishes" this year for a successful annual conference but rather my congratulations in advance for such an exciting program. Thank you.

President Meek: You know, that guy is a hard act to follow. Vinnie, we really enjoy having you here and appreciate your remarks very much. And we'll see that you get your pin! I'll now turn the rostrum over the Mr. Budzileni.

Greetings from REMSA

President Budzileni: The Railway Engineering Maintenance Suppliers Association, this year, as they have in the past, has materially assisted our Associations with their support. This conference would not be possible without them. At this time it is my pleasure to present Mr. J. Knox Kershaw, president of REMSA. Knox is also president of Knox Kershaw Company of Montgomery, Alabama. Mr. Kershaw.

Mr. Kershaw: President Buzileni, President Meek, special guests, ladies and gentlemen. As president of REMSA I am honored to have been asked to join opening the 89th annual conference of the American Bridge and Building Association and the 96th annual conference of the Roadmasters' and Maintenance of Way Association of America. I know that the members of REMSA join me in wishing you a very successful and productive 1984 conference.

At the same time it is certainly significant to note the longevity and the impact of the Bridge & Building and Roadmasters' groups in the association field. It is difficult to think of such continuity of service among associations in other fields.

At this time I would like to present to Jim Budzileni on behalf of our membership, REMSA's Gold Pin Award which reads, "President, American Railway Bridge and Building Association, 1983-1984." Congratulations Jim, you have been a great president.

President Budzileni: Thank you.

Mr. Kershaw: And also to Huburt Meek, I would like to present a matching pin which reads, "President of Roadmasters' and Maintenance of Way Association of America, 1983-1984." Huburt, congratulations.

President Meek: Thank you very much. I'll wear this proudly. This is a fine organization that made this presentation and we're very happy to welcome all REMSA members here today. Thank you.

Mr. Kershaw: REMSA hopes that the stay of all delegates to this conference will be a pleasant one. The officers and directors of REMSA are at your call. If we can do anything to help make your stay more enjoyable and problem-free, please don't hesitate to call on us. We're looking forward to having all of you at the REMSA First Annual Reception on Tuesday evening in the Grand Ballroom. Thank you.

President Budzileni: Thank you, Mr. Kershaw. We have always enjoyed the generous hospitality and reception you have shown our Associations. We appreciate the efforts put forth by REMSA to sponsor such a fine affair. We ask that members pick up reception tickets only if you are going to attend. If, after acquiring your tickets, you find that you cannot attend the reception, please return the tickets well in advance of the reception.

Introduction of Mr. Martin

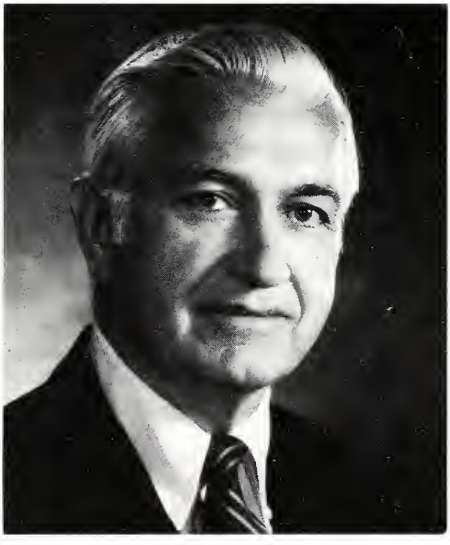
At this point I would like to introduce the President and Chief Operating Officer of the Illinois Central Gulf Railroad. Mr. James E. Martin graduated from Kent State University, and started his career with the New York Central, and then moved on to

three other railroads, the Lehigh Valley, Penn Central, Chicago, Rock Island & Pacific. He spent two years with the Association of American Railroads and in 1978 joined the Illinois Central Gulf Railroad and is presently President and Chief Operating Officer. May I present Mr. James E. Martin.

Short Line Railroads

by James E. Martin

President & Chief Operating Officer
Illinois Central Gulf



James E. Martin

Good morning! You're all looking well today — but did any of you get a good look at Jim Budzileni? Don't you think he has aged since the last time you saw him? If you agree — I am partially responsible for what you see.

When Jim asked me to speak to you, the date was open on my calendar, so I gladly accepted. Then, a conflict arose and Jim was told he would have to find a substitute, which he did. A couple of weeks after that, there was another change in may plans. Jim was called again. My substitute relinquished the podium, but by that time Jim wished he hadn't been involved.

However, I am very glad things worked out so that I could be here.

Giving a talk first thing in the morning does present problems, especially when the group is comprised of professional railroad engineering officers. Since I didn't want to lull you back to sleep, I wanted to choose a subject that would be interesting, related to railroading, and, at the same time, an issue that perhaps most of you have not given too much thought.

Well, after all that deliberation, I decided to talk about short line railroads: the recent emergence of a large number of short line railroads; development in the railroad industry fueling the increase in short lines; what it means to the Class I Railroads; to rail users; to railroad employees; and to the communities along the rail lines.

Historically, short lines have been a vital part of railroading, but in the late 1970's and early 80's they have been gaining in numbers, in stature, in influence and in importance. There is an interesting resemblance to the early years of railroading, when development of short segments of railroads grew rapidly in our country and the current proliferation of short line operators in the twentieth century.

Today, there are about thirty Class I Railroads and nearly four-hundred short lines.

Short line railroads deserve our attention. With mega-mergers, consolidations, and individual system rationalization, remaining super-railroads and regional carriers will depend on short lines to fill the void.

The Illinois Central Gulf Railroad has seen segments of its trackage become the operating properties of at least ten short lines in eight states. These companies grew

out of former ICG secondary mains or branch lines that had been designated as candidates for discontinuance. The same is happening on all major carriers in the nation.

How did this recent short line development get under way?

What does it mean for the nation's rail transportation users?

What are the advantages and disadvantages of short lines?

Who are the owners and operators of short lines?

And — What is the future for these railroads?

College professors, transportation industry researchers, and others are devoting articles, papers, and books to contemplating questions such as these. The subject of short lines is high-profile now and will probably continue to be of great interest as railroad deregulation changes the shape of our industry.

Many factors have aided in the acceleration of the short line phenomenon.

Federal and state legislatures, supported by the Department of Transportation, have enacted legislation providing the authority, entitlements, and funding which have stimulated the growth of short line railroads. Shippers, receivers, investors, and communities have also joined together in establishing, supporting, and operating short lines.

Short line development over the past 15 years has progressed across the United States in a wave almost identical to that of the settlers who opened up the country in the eighteenth and nineteenth centuries. The bankruptcy of the Penn Central and their subsequent abandonment of thousands of miles of rail lines spurred the start of many "new" short lines in the east. Then the development spread westward, first to the great lakes and upper midwest, then out onto the great plains, and onward to the Pacific. Of course, the financial crises of the Rock Island and the Milwaukee Road had a great impact on the midwest. As my own railroad — and others operating in the south continue to rationalize their systems — interest in establishing short lines has increased significantly.

Short line expansion is a reality and important to many groups.

Example:

On-Line Communities — Short lines preserve rail transportation for the local industries in the area. With involvement of communities and their industries, additional industrial growth potential is created and job opportunities become available. In fact, the entire economic climate may improve where there is commitment by local government, investors, and local citizenry.

Some state and county agencies are so determined to retain rail service that they buy lines being discontinued by railroads and operate them as "Industrial Development" attractions. This works when there is sufficient business to warrant local municipal ownership, or the potential exists for consistent future revenues from a new plant coming into the area.

Carload Shippers and Receivers — and Some Intermodal Customers served by short lines get "home-town" rail service at competitive rates.

It is also possible for the short line operators to provide local shippers with a car supply tailored to their individual needs and train operations, plant servicing, switching, and interchanges on a basis more compatible with their operations.

Of course, the most important feature of a short line operation to shippers and receivers is the retention of rail service to their plants, which would have ceased if the lines were abandoned. To avoid misunderstanding — railroad abandonments seldom close a plant. Alternate transportation is almost always available. In fact, that "alternate transportation" may have been one of the primary reasons the Class I Railroad made the decision to dispose of the line segment.

Some individual shippers or groups of shippers have acquired rail lines and operated them as short lines. In many instances, there are economic reasons for doing this. Many shippers have a strong desire for a firm grip on inbound and outbound service, controlling car supply, and being able to share in freight revenues.

Railroad employees are adversely affected when a major carrier abandons a line. In most cases, however, employees are offered employment opportunities with the

short line operator.

As is the case with any company, employees make the difference between "success" and "failure." Short line operators welcome the chance to hire experienced people to run the trains, repair the track, fix locomotives and cars, and manage the operation.

Trunk line railroads benefit from the road haul traffic generated by the short line operator. Generally, the trunk line interline revenues remain at nearly the same level as the previous operation, a unique arrangement of retention of revenue without the expense of operating the line segment.

In addition, the railway supply industry may benefit from the initial start-up of a short line operation. Maintenance materials and rolling stock materials usually are needed by the new operator.

And *The Taxpayer* benefits, too! A rail line preserved as a viable short line goes on paying property taxes, sales taxes, employment taxes and income taxes.

It would be misleading to imply that everything is rosy in the short line railroad business. Some operators are beset by financial troubles. These could be the result of undercapitalization from the beginning — carloads and revenue falling below projections, operating costs running higher than expected, planned efficiencies or shipper support do not materialize, inexperienced management.

However, statistics reveal that only about 15 percent of short lines have experienced major difficulties in staying viable.

About 40 percent of the short lines are owned by Class I Railroads. ICG is sole owner of one short line, the Waterloo Railroad, and has percentage ownership in three other operating short line railroads — one in Illinois, one in Missouri, and one in Mississippi.

Railroad shippers are involved in about half of all short line operations. There is good reason for this. Shippers, producing large volumes of freight, need frequent switching and dispatchment. In effect, large producers of products want control of service and car supply while generating revenues to cover some of their costs. Steel, chemical, and paper companies are most prominent in operating their own railroads.

Close on the heels of railroads and shippers as short line owners are a range of individuals and companies I will call short line operators. Sometimes shippers and operators run the lines themselves. More often they hire others to manage the short lines for them.

A case in point is "Kyle Railways" of San Diego, California. They are the largest owner, operator and manager of short lines, some of which are not so short. They operate thirteen separate railroads and are in the process of developing their fourteenth venture in a short line development.

Early this year ICG and L.B. Foster Company, Pittsburgh, announced that Foster will acquire 713 miles of our railroad's lines in east Mississippi and Alabama. This former ICG trackage will become a short line called the "Gulf & Mississippi Railroad." Actually, the G&M will be more of a "regional" railroad.

L.B. Foster Company will *own* the Gulf & Mississippi, but the Kyle Railways Organization will operate it. They will combine local Mississippi talent with Kyle expertise and procedures common to all Kyle operations. G&M's prospects are good because it has Foster financial backing, good business potential, excellent connections with trunk line railroads, a solid rehabilitation plan to upgrade the track and facilities, and seasoned, capable management. This combination of factors should produce a positive result for its owner.

I would like to recap what short line railroad operations mean to all of us:

For my railroad — and others — short lines provide a means to streamline our system. They allow us to turn over to local managers the operations of some branch lines that would otherwise be abandoned. This is a realistic alternative to line discontinuance.

For communities along light density rail lines, short lines offer hope for continued service for shippers and receivers. They ensure the preservation of jobs and the tax base of communities so vitally important to their economic health.

And, finally, the development and success of short lines is greatly enhanced through the availability of local, state, and federal funding.

For rail customers, short lines, with their

flexibility and real time service, can be invaluable in keeping their commodities moving by rail.

All of us can think of shippers who need and want good rail service. Short lines can fill those needs and wants if properly structured and managed.

For suppliers, short lines mean the potential for orders for materials and supplies.

For many railroaders, short lines may be the answer to declining employment in Class I Railroads. They need people who are dedicated and well-qualified in railroad operations. Perhaps in the future some of you will work for a short line carrier.

For our country and its economy, well-managed short lines benefit everybody. They help preserve important rail services. They fill the void for transportation services in areas where Class I Railroads can no longer operate profitably.

The future of short line railroading in America is bright. Illinois Central Gulf encourages the planned development of short lines because we believe that this form of rail transportation will continue to be a growth industry in the distribution network of tomorrow.

In the early stages of transportation in our country, railroads were at the forefront of the emerging transportation industry.

Today — and in the future — I am confident that we will see the strength of our national railroad network maintained and reinforced by the growth in short line railroad operations.

Once again, I am glad I was able to be here and participate in your conference.

Mr. Budzileni: Thank you, Mr. Martin. It was a very interesting talk. As you know, Mr. Martin is presently my boss. But it just so happens that Mr. William Gibbons was my boss also. Just a few words about Mr. Gibbons' background. He is a native Chicagoan, has a Bachelor of Philosophy from Loyola, and received his Attorney-at-Law degree from Loyola. From 1942 to 1946 Bill served in the Navy in the South Pacific Campaign. Being a lawyer, he worked for many law firms. From 1975 to 1984, Mr. Gibbons was Trustee for the Chicago, Rock Island and Pacific Railroad, from June 1984 to present he serves as consultant and is a member of the Board of Directors to the Chicago Pacific Corporation. Mr. William Gibbons.

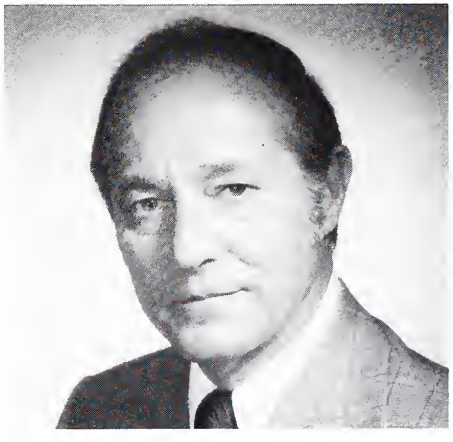
Liquidation Problems of the "Rock"

by **William M. Gibbons**

Consultant
Chicago Pacific Corporation

Gentlemen. I feel a bit out of place among a gathering of experts on track and bridge construction and maintenance. Until March 1975 when I was appointed trustee of the bankrupt Chicago, Rock Island and Pacific Railroad, my experience with railroads was largely confined to that of the majority of Americans — namely occasionally riding on passenger and commuter trains, and now and then fuming in my car at a grade crossing awaiting passage of a seemingly endless freight train. However, starting with that early spring day some nine and a half years ago, my education in railroading proceeded at a meteoric pace.

The Rock Island was at that time, as I recall, the twelfth largest railroad in the United States. Back in the early 60's a mer-



William M. Gibbons

ger of Rock Island into Union Pacific, with sale of its southerly lines to the Southern Pacific had been negotiated. Such proposals languished through more than twelve years of ICC hearings; 200,000 pages of testimony and 50,000 exhibits. The bride became wrinkled and worn, and the groom turned her away after an ICC approval in 1975 replete with impossible conditions.

Meanwhile, needed maintenance of the property was deferred and service deteriorated. Revenues declined, losses mounted, and dividends became but a fond memory to our long-suffering shareholders. The inevitable occurred and the once proud "Rock" went into a Section 77 Bankruptcy for the third time in this century.

With the onset of bankruptcy and its attendant court protection, we had an opportunity to catch our breath, hitch up our pants, and get to work to try to save the railroad — and for a time it appeared that we would be successful in doing so. With enactment of the 3R and 4R Acts, we sought governmental support and did receive some, although far less than was needed; and it was designated substantially to rehabilitation and upgrading of rolling stock. Sixty-eight new locomotives and over 5,000 cars were acquired, together with initiation of an upgrading program on existing equipment. Some track rehab was done — basically in three areas with three sources of financing. With the minor amount of federal funds available to us for such work we were able to renew ties, surface track and relay some rail on our double-track mainline between Joliet and Silvis, Illinois. As a result, one track through that territory was restored to 60 mph freight train operation. With state and shipper loans, we upgraded a number of Iowa branch lines which had become the source of unit grain train movements utilizing jumbo covered hopper cars, the effect of which on a track structure designed and maintained for 40 ton boxcar traffic needs no further comment in a group such as this. Finally, on our Sunbelt Line, we instituted a tie and surfacing program with internally generated funds.

I would point out here that 1974 estimates for rehab of the entire 7,000-mile-plus system ranged between $200 million and $900 million. All told, we were able to borrow about $70 million for both track and equipment.

Our struggle to get the Rock Island back into the "black" appeared for a time to be well on its way to success; however, we ran into several roadblocks which finally proved to be impenetrable. First was the winter of 1976-77, which was the worst winter in history over much of the territory in which the Rock Island operated. Bad as that winter was, its record was short-lived as the winter of '77-78 was even worse, and almost unbelievably, was followed by a still worse one in '78-79. Had the trend continued, I suppose we would have all been living in igloos by now. Compounding the problem was the drastic increase in fuel prices during those years. They doubled between December 1978 and May 1979. The final blow was a strike by the two labor unions — BRAC and UTU — which represented the lion's share of our employees. The strike began in late August 1979. Through yeoman service by our loyal corps of officers, the most essential services were continued throughout the strike. However, in early October, the Interstate Commerce Commission declared the Rock Island "cashless" and ordered its operation taken over by the Kansas City Terminal Railway Company as Directed Service Carrier.

A plan of reorganization was drafted which would have reduced the Rock Island from about 7,000 route-miles down to approximately 2,000. Our projections at that time indicated a profitable operation. I would point out, however, from the standpoint of "hindsight," that those projections never envisioned the severe economic malaise which the nation was facing and from which we are but now recovering, nor did they envision the competitive climate which we would have faced as a result of the mega-mergers and deregulation which have taken place in the railroad industry within the past few years. Additionally, the plan required a $20 million cash infusion.

Judge (now Chief Judge) Frank McGarr, who had the unenviable task of overseeing our bankruptcy proceedings for more than nine years, must have had foresight which was the equal of our "hindsight" when he ruled, on January 25, 1980, that the Rock

Island could not be successfully reorganized as a railroad and must, instead, be liquidated. Following the liquidation order, immediate steps were taken by the KCT to wind down its directed service operations, and on March 23, 1980, all rail operation ceased. The KCT terminated all employees except those required to complete the accounting functions attendant to its six months of operation. I began the lengthy and enormously complicated task of liquidation with about 550 people. Never in the history of American railroads had liquidation of a property the size of the Rock Island been attempted. Comparison is often made with the Penn Central's situation; however, it must be recalled that liquidation of 80 percent of that much larger property was accomplished with one stroke of the congressional pen by the formation of Conrail, while ours was accomplished piece by piece through thousands of sales over a period of just over four years.

Initially, all of our "friends" on the outside — shippers, politicians, the ICC, FRA and other railroads — licked their chops as they envisioned an immediate "fire sale." It was my avowed intention from the beginning that this would not be the case. It was vital that as much of the property as possible be returned to an operating status at the earliest possible date, and to that end our initial efforts were devoted almost entirely to the negotiation of interim leases whereby the property was maintained, the public served, and rentals were negotiated which covered the continuing costs of the liquidation process. I might add here that such rentals eventually returned a substantial profit to the estate.

Sale negotiations proceeded slowly as we endeavored to secure prices which reflected the true value of the property. Virtually every prospective purchaser began negotiation on the same note — a litany of the deploarable physical condition of the subject line or lines, the difficulty in wooing shippers back to use of rail service, the enormous expenses which the purchaser was facing in what would come close to being described as a charitable effort to restore rail service to an area which was facing almost certain disaster otherwise. In fact, the arguments were so similar in their content that I suggested — not entirely facetiously — that perhaps we should record them, and simply play the tape at the beginning of each negotiating session, thus expediting the procedure for everyone involved. One of my colleagues suggested that we add a violin accompanist.

I must comment that our friends in government were not overly helpful at this stage. The FRA, which had initially taken the position that the entire Rock Island system was redundant and should simply disappear to the accompaniment of a sigh of relief from all concerned, now established its set of net liquidation values for the line segments in negotiation. However, in the first place we rejected the concept that net liquidation value was an appropriate price for a line of railroad upon which someone proposed continued operation. After all, one does not buy a line of railroad for the purpose of scrapping it; and its value on a going concern basis is obviously substantially greater than it is if picked up as scrap. Second, even if one were to accept the net liquidation value concept, the method used by the FRA to determine such value was, in our view, inappropriate. Rights-of-way were, as I recall, generally regarded as valueless. All rail sections under 112# were regarded as scrap. Our experience indicated that values determined on this basis were not reflective of the "real world," and we steadfastly refused to be swayed by it.

Inasmuch as we were in effect, "plowing new ground" we were on a learning curve. Our earliest sale, and one of our largest, was the sale of the so-called Tucumcari Line to the Southern Pacific for $57 million. This sale was, in fact, negotiated in 1978, well prior to the liquidation order. The price, arrived at after three years of negotiation, was a fair one — well under our initial asking price, but over twice the SP's initial offer. However, the sale agreement contained no provision for escalation. The approval process was lengthy — during a period of unprecendented double-digit inflation. When the sale closed in late 1980, the $57 million price was considerably below the price which the property could have commanded at that point in time. Needless to say, subsequent contracts con-

tained provision for indexing the sale price to reflect the inflationary trend between the date of agreement and the date of closing.

Likewise, the sale conveyed all rights which Rock Island had held in the properties being sold. Early on, it occurred to me that we were perhaps giving away valuable collateral rights. So we commenced negotiation on the basis of our retention of easement and mineral rights. In a few cases the purchaser was adamant in insisting that such rights be conveyed and they were — at a substantial additive to the price and with provision for "carry-thru" rights. The value of such retentions become more and more evident as sales of easements for fiber-optics lines, pipelines, and wire lines were accomplished to the extent of over $20 million to date.

Another retention, which was essential to avoid "orphaning" many segments of our railroad and making them virtually unsalable, was that of our right to designate purchasers of contiguous segments of our property to receive trackage rights over segments heretofore sold to others. Trackage right agreements — subject to certain constraints — would be between the owner and tenant line, and the owner would receive all revenue therefrom. Our right of designation was designed solely to keep the purchaser of one segment of our line from preventing our sale of an adjacent segment by refusal to grant trackage rights to the purchaser of that segment or by imposing onerous conditions.

Obviously, the Rock Island was not redundant in its entirety as many had contended. However, it was equally obvious that there were segments which had little, if any marketability as lines of railroad. These were not necessarily all the "two streaks of rust" branch lines which were targets for abandonment while we were still operating. Some were segments of what had been important main lines for the Rock Island but which did not fit into a configuration valuable to a potential trunk-line purchaser and which did not produce local traffic sufficient to justify a short-line operation. Consequently, after spirited competitive bidding, in late 1981 we entered into a three year contract with L.B. Foster Company for dismantlement and marketing of designated line segments. This contract has recently been re-negotiated by Chicago Pacific Corporation, the successor company, on a basis which will permit a substantial reduction in inspection, policing, and paperwork as remaining line segments become available for dismantlement.

I have stressed herein our experience in liquidating lines of railroad, since I believe that that is the area of the liquidation process which would primarily interest this group. This does not, however, overlook the simultaneous sales of non-rail real estate, sale of easements and conversion of licenses to easements, sale of rolling stock, and all of the many activities which culminated in the most successful reorganization of a bankrupt company in American history. As of May 31, 1984, the final day of my nine-year tenue as Trustee and the final day of the 132 year history of the Rock Island Railroad, we had successfully sold or negotiated the price of the following properties:

Rail lines	$370 million
Non-rail real estate	50 million
Easements	20 million
Rolling stock and personal property	76 million

A total of approximately $516 million.

On June 1 of this year a new company — Chicago Pacific Corporation — emerged from the Rock Island reorganization. Creditors were paid in full plus interest (some had elected earlier to settle and accept less than 100 percent in order to obtain immediate payment of their claims). We delivered to the stockholders a viable organization, with cash and securities of approximately $200 million and railroad properties with a book value of $52 million still to be developed or disposed of. In addition, there remain operating loss carry-forwards of $135 million available to offset gains from liquidation of property and income from other sources through 1996. Stock, which reached a low of $1.75 a share at the time banruptcy was entered into, is now selling for around $80 a share. Those of us who have been a part of the history of the liquidation of the "Rock" and its reorganization as Chicago Pacific Corporation

have shared a unique experience, and I hope that I have been able to share with you briefly today some of the flavor of that experience. If there are any questions I will be happy to do my best to answer them. Thank you again for asking me here today.

President Budzileni: Thank you Mr. Gibbons. We all enjoyed the information and maybe other people can profit by it. At this time Mr. Bessey will introduce our next special feature. Hazardous Material Response.

Mr. Bessey: The first special feature is entitled "Hazardous Material Response Presentation" which will be given by Robert M. Graziano, Vice President Business Development, O.H. Materials Company, Findlay, Ohio. Mr. Graziano attended Villanova University and Academy of Advanced Traffic, and started his career on the Long Island Rail Road. In 1967 he was with the Association of American Railroads, Car Service Division. He then joined the Bureau of Explosives as a special representative and was appointed Director of Bureau of Explosives in 1970. Mr. Graziano is a member of the National Defense Transportation Association, American Society for Testing Materials, the National Solid Waste Management Association, and the Traffic Club of Washington. He is also a member of the Executive Committee of the Spill Control Association of America, Canadian Transportation Commission, and many times has represented the rail industry for the legislative committees and regulatory agencies. So, with those credentials, Mr. Graziano.

Hazardous Material Response

by Robert M. Graziano

Vice President Business Development
O.H. Materials Company

Thank you very much, Don. I would like to talk to you today about derailments involving hazardous materials. What does a hazardous material contractor do in response to your calls. I'd like to discuss some of the case studies that we've been involved in, so that you can get a first-hand view of what it's like to deal with hazardous materials, and I'd like to also impart to you some of the new considerations that you folks have to take into account in dealing with hazardous materials, and that's departmental consideration which I think some of you may have seen coming along in the past few years. I've prepared a slide presentation for this subject today and would like to ask that you turn the lights down and prepare the slide projector for me. Thank you.

OVERVIEW OF O.H. MATERIALS CO.

O.H. Materials Co. (OHM) is a firm that specializes exclusively in hazardous materials situations, assessments and cleanups. The Company offers many diverse hazardous material cleanup services, including:

Emergency Response
- Oil spill containment and cleanup
- Chemical spill containment and cleanup
- Chemical transfer and tank patching services
- Explosive material handling, segregation, disposal, and destruction
- Radioactive material cleanups

Contaminant Hydrogeology
- Hydrogeologic assessment
- Monitor well design and installation
- Contaminant plume definition
- Groundwater recovery and treatment
- Subsurface oil recovery
- Remedial alternatives evaluation

Temporary Treatment Services
- Groundwater treatment (industrial and municipal)
- Auxiliary industrial wastewater treatment

- Oil/water separation
- Leaking underground storage tanks
- Lagoon cleanups
- Sludge dewatering
- Demonstration of treatment technique feasibility
- Recovery of valuable products

Contaminated "Landfill" or Disposal Site Cleanups

- Hazardous material handling with drum grapplers and other specially designed equipment
- On-site treatment/destruction
- Liquid bulking via compatibility chambers
- Soil decontamination
- Groundwater treatment
- Management of transportation and disposal needs
- Site restoration services

Decontamination Services For Contaminated Buildings, Equipment, and Other Materials

- Interior and exterior wall decontamination
- Process equipment decontamination
- Building or material dismantling
- Materials crushing, cutting, and handling for disposal
- Asbestos cleanups

Explosives Materials Control

- Decontamination/transfer of explosive materials or residues
- Segregation and disposal of shock-sensitive materials
- Surface and subsurface cleaning of explosive impact areas
- Demilitarization and demolition services

Treatment Feasibility Evaluation Services

- Solid/liquid separation techniques
- Biological studies
- Adsorption techniques including:
  — carbon adsorption
  — polymeric adsorption
- Ion exchange techniques
- Membrane techniques
- Chemical treatment techniques
- Thermal destruction techniques
- Product recovery evaluations

Analytical Services

- Field and mobile laboratories
- Sample collection and preparation
- Protocol development
- Metal analyses
- Inorganic chemical analyses
- Priority pollutant analyses (GC/MS techniques)

Management of Underground Storage Tanks (OHM MUST PROGRAM) For Tanks Storing Fuels, Solvents, & Other Chemicals

- Tank testing
- Monitoring well installation
- For power systems with underground tanks:
  — fuel sampling
  — fuel filtering
  — on-going fuel management program
- Individualized preventative maintenance programs
- Remedial action as needed

DISTINGUISHING CHARACTERISTICS OF O.H. MATERIALS CO.

OHM has been a leader in hazardous materials containment, collection, treatment, and mitigation for more than a decade. The Company has been involved in thousands of successful hazardous waste cleanups varying in size from small spills, where the problem was solved for less than $500, to multimillion dollar abandoned dump site cleanups. The Company's services have been used by both industrial firms and government agencies. OHM is proud that it has never had any accident or health-related incident directly related to its cleanup efforts. The Company attributes this to rigid health and safety policies and training programs; project management expertise; and the rigorous design, fabrication and maintenance of its specialized cleanup equipment.

The Company's primary goal is to accomplish a cost-effective and permanent cleanup of hazardous materials by promoting total destruction, as feasible, of all hazardous materials. Toward this end, OHM has invested heavily in mobile treatment equipment, which can be used on site to render hazardous materials harmless. This equipment is further described in Section 1.0 enclosed. The variety of treatment equipment and related technology offered

by OHM is its most distinguishing characteristic.

Also enclosed is a brief description of:

The sampling and monitoring equipment offered by OHM.

The qualifications and training of OHM's personnel.

The personnel protective equipment available for use by OHM.

The analytical laboratory capabilities of OHM.

MOBILE TREATMENT EQUIPMENT

OHM designs and constructs mobile treatment equipment to meet the specific waste treatment needs of its many clients. This equipment is modular in design for economical installation in temporary treatment situations and is fully mobile to facilitate rapid deployment. With these systems, on-site and/or full-scale feasibility studies may be economically accomplished in a relatively short time period.

OHM also offers pilot scale testing facilities for in-depth feasibility studies. These studies may be performed on-site in a mobile laboratory or at OHM's Technical Services Laboratory in Findlay, Ohio.

The following sections describe the mobile treatment equipment available; pilot studies can be conducted on any of these technologies.

Underground Recovery Treatment System

OHM has designed a unique underground recovery treatment system, which is used to remove underground contamination of soil or groundwater.

The underground recovery system operates by hydrodynamically controlling groundwater flow by injection and pneumatic recovery through multiple injection and recovery wells. Technicians can manipulate the system to control groundwater flow patterns to remove maximum amounts of contaminants. A flushing medium, usually water, is injected into the soil to flush contaminants from interstitial spaces. Injection wells are spaced to provide a controlled pressure gradient throughout the spill area. The pneumatic recovery system creates a cone of depression which accelerates the movements of the contaminants toward recovery wells.

Once removed, the effluent of the recovery system enters a treatment system for subsequent treatment and reinjection or discharge. The treatment systems are constructed to treat the contaminant in such a manner as to render it harmless, while simultaneously minimizing or eliminating the volume of necessary off-site disposal. The underground recovery system thereby reduces or eliminates excavation, transportation, and disposal costs. In addition, the system can be employed without interrupting normal business operations at the site.

Biodegradation Treatment Systems

The use of selected microorganisms in the degradation of organic materials has become of great technological importance in the waste treatment industry. Bacteria have become available to degrade a wide variety of toxic and non-toxic hydrocarbons. OHM has developed treatment systems that incorporate these bacteria to alleviate specific contamination problems. When coupled with underground recovery systems and/or treatment systems, in situ biodegradation is accomplished in a low-cost, semi-automated manner.

Furthermore, remedial degradation by injected bacteria can remove low-level residual contamination. The use of a biodegradation treatment system eliminates excavation and associated disposal and transportation costs, while allowing normal activity to occur in the treatment area.

Clarification Equipment

The portable clarifier is analogous to a primary clarifier at a wastewater treatment plant. The mobile clarifiers are 10,000-gallon-capacity rectangular tanks constructed of carbon steel.

The primary purpose of the clarifier is to remove suspended solids and heavy metals using pH adjustments or the addition of flocculants. The clarifier can also be adapted for use in hydrogen peroxide oxidation of organics.

The clarifier increases the cost effectiveness of other treatment modules by removing most of the solids which otherwise might clog multimedia filters, or other unit operations. The clarifier is equipped with surface skimmers, variable baffle configurations, and automatic sludge removal

Multimedia Refiltering Equipment

OHM has a variety of pressure filters that can be filled with the filter media desired. These pressure filters can be used in any application where removal of filterable suspended solids is desirable.

Oil Separation Equipment

Physical separation of oil and other lighter-than-water organic materials from water is accomplished by specialized oil separation equipment. One system consists of a combination parallel plate/coalescing tube separator, which mechanically separates emulsified oil-water mixtures. In situations where the waste stream contains varying amounts of oil, this separation technique allows for removal of a large percentage of contaminants in a fast, cost-effective manner. Once removed, this material may be disposed of in bulk or recycled for use as an economical heat source.

Carbon Adsorption Filtering Equipment

OHM has designed and fabricated mobile carbon filters. These filters use granular-activated carbon inside cylindrical fixed-bed cells to remove dissolved organic material from wastewater. These mobile filters are adaptable for use with vapor-phase carbon, allowing for removal of airborne organic contaminants.

OHM's mobile carbon filters are fabricated in 1-cell, 2-cell, and 3-cell units, and are of carbon steel construction. Various lining materials can be applied to protect the adsorbers.

Each carbon filter is skid-mounted and able to be transported by truck, train car, barge, crane, etc., making the unit extremely mobile. Each unit is equipped with all the necessary piping, pressure gauges, and valves to allow the individual filter cells to be operated either in series or parallel, down-flow or up-flow, or as an individual cell. To allow convenient sample collection and monitoring of contaminant removal, sample valves have been installed on each unit.

Volatile Organic Removal Equipment

OHM has a variety of equipment available to remove volatile organic compounds from wastewater. Depending on the compound and the ease at which it can be removed from the aqueous phase, several options in choice of equipment are available.

Open-vessel air sparging of holding pools is the simplest system. This system consists of portable pools and aeration systems coupled to effectively transfer the contaminant from the aqueous to the vapor phase.

The remainder of this type of equipment is designed around the principle that mass transfer can be increased by raising wastewater temperature with a steam-fed tubular heat exchanger. The volatized compounds are directed to condensers to recover the components for reuse, disposal, or incineration. OHM mobile equipment of this type includes: waste-stream preheating, steam stripping, and heated volatile organic-sparging units. All units are equipped with appropriate temperature and pressure gauges, valves and piping, thus making them self-contained units.

Ion-Exchange Equipment

OHM has available mobile ion-exchange beds developed for the removal of inorganic containants. The ion-exchange beds are fabricated in single and multi-bed designs capable of holding an ample volume of resin. As found with all of OHM's water-treatment equipment, these units are fully mobile and are designed to allow for convenient sample collection.

Ultraviolet Purification Equipment

The use of photooxidation in wastewater treatment systems has become of increasing importance in recent years. OHM offers ultraviolet chambers for disinfection of water and treatment of halogenated and non-halogenated organic and inorganic compounds in water. The system incorporates a "thin-film" gravity flow design allowing for treatment capacity ranging from 20,000 gallons per day (gpd) to 15,000,000 gallons per day (gpd). An automatic wiping device removes any harmful buildup that may decrease lamp efficiency.

Ozone Treatment Equipment

Ozone treatment to oxidize a wide variety of organic and inorganic contaminants is available through OHM. Ozone may be

employed in a total waste treatment scheme to disinfect the waste effluent and to oxidize color bodies, cyanides, phenols, iron, and manganese.

Mobile Reverse Osmosis Equipment

OHM has a lease arrangement for the use of mobile reverse osmosis treatment equipment.

Centrifugation Equipment

To remove solids from sludge or viscous liquids, OHM utilizes a specially built mobile centrifuge unit. This unit is mounted in a 42-foot box trailer along with feed pump, motor, controls, and other auxiliary equipment.

The centrifuge features influent solids handling with a capacity of 5%-50%, maximum flow capacity of 150 gpm and a size reduction device to reduce influent solids to less than $\frac{1}{4_0}$ in diameter.

The centrifuge is modular in design and can be used as part of a complete system or as an autonomous unit.

Mobile Laboratory Facilities

Information pertaining to the efficiency of waste removal is necessary to the operation of any waste treatment system. Effluent concentrations often must be monitored to ensure that discharged water is free from contamination. OHM offers a mobile laboratory facility to monitor effluent waters, as well as the full-scale process. The specifications, capabilities, and available equipment of the mobile laboratories are addressed in Section 5.2.

Ancillary Equipment

To have a smooth operating system, proper pumping, valving, and transferring equipment must be used. OHM supplies a complete complement of the necessary equipment with any treatment system. Often specialized equipment is necessary when working with hazardous wastes. Specialized equipment includes: portable hydraulic power packs; high rate delivery pumps; viscous material pumps; acid pumps; nitrogen purging systems; pneumatic transfer systems with air dryers and fume scrubbers; steam heating equipment (up to 1,000,000 BTU); temperature monitoring devices; stainless steel, Teflon-lined hoses; acid hoses; metering equipment; vapor control systems; power entry tools; tank patching equipment; and stainless-steel Teflon, PVC, and other piping components.

SAMPLING/MONITORING EQUIPMENT

OHM has a wide variety of equipment available for obtaining representative samples in various matrices. Approved sampling equipment and methods are employed for obtaining water, soil, air, and sludge samples.

Soil Sampling

- Portable Split-Barrel Samplers
- 4″ Sample Triers
- 2″ Sample Triers
- Portable Augers
- Veihmeyer Portable Drill Rig
- Iwan Hand Augers

Wastewater Samplers

- Glass Coliwasa Samplers
- Stainless-Steel Bacon Bomb Samplers
- Labline Water Samplers (Weighted)
- Subsurface Grab Samplers
- Suspended-Solids Samplers
- Surface Layer Sampling Bailers

Groundwater Sampling and Purging Devices

- Teflon 1¾″ Bailers
- PVC 1¾″ Bailers
- Stainless-Steel 1¾″ Bailers
- 2″ Teflon Air-Lift Samplers
- 2″ PVC Air-Lift Samplers
- Bladder-Style Groundwater Sampling Pumps
- 1¾″ Submersible Pumps
- ISCO Sampling Pumps (Battery Operated)
- AC/DC-Operated Peristaltic Pumps

Geotechnical Equipment

- Mobile B-47 Drill Rig
- Mobile B-24 Drill Rig
- Split Tube Samples
- Shelby Tube Samplers
- Hollow Stem Augers
- Solid Stem Augers
- Diamond Core Drilling
- Fluid Rotary Drilling
- Pressure Transducers

Air Monitoring Equipment
- MIRAN
- Photoionization Detectors
- OVA
- Personal Air-Sampling Pumps
- Oxygen Meters
- Explosimeters
- Dreger Pumps With Assorted Detector Tubes
- Dosimeter
- HCN-Monitor Personal Alarm System
- Weather Station (Temperature, Barometric Pressure, Anemometer, Wind Vane)
- Sling Psychrometers
- Hot Wire Anemometers
- Mercurial Barometers
- Sulfur Dioxide Monitors
- Portable Carbon Monoxide Monitors
- Ozone Recorders
- NO/NO_x Analyzers
- Vinyl Chloride Dosimeters
- Mercury Vapor Monitors
- Portable Halide Detectors

Groundwater Monitoring Equipment
- Portable pH Meters
- Dissolved Oxygen Meters
- Conductivity Meters
- K-V Ground Water Flowmeters
- Electronic Water Level Indicators
- Temperature Meters
- Downhole Meter Probes

PERSONNEL

This section outlines OHM's personnel and their functions and training in the hazardous materials cleanup industry. The Company has approximately 200 full-time employees consisting of professional, technical, and support personnel.

Professional Personnel

Engineers, chemists, biologists, hydrogeologists, and environmental scientists are the core of the professional staff at OHM. The primary function of this group is to provide technical support for specific field projects; members of this group have had extensive on-site experience.

Technicians

OHM has two distinct groups of highly trained technicians. One group is responsible for the operation and maintenance of various treatment equipment. The training this group receives consists primarily of "hands-on" experience with the equipment under supervision, both on-site and at the home office. Daily meetings are held to instruct all field technicians on safe operating and maintenance procedures when using the equipment.

The second group of technicians is trained in sample collection, groundwater and soil investigations, and ambient air monitoring. This group is trained in approved methods of sample collection, soil-boring techniques, and air monitoring. Constant retraining of this group occurs as new monitoring techniques are developed.

General Personnel Information

TRAINING

All employees are trained in the proper use and maintenance of various types of protective equipment. All employees are fit tested for respiratory protective equipment at the start of employment and instructed in the use and limitations of protective equipment in various situations. Similar fitting for protective clothing also occurs during this training period.

EMPLOYEE HEALTH MONITORING

All of OHM's personnel participate in a medical and health monitoring program. This program is initiated when the employee starts work with a complete physical and medical history workup. Developed in conjunction with outside consultants, one specific doctor is assigned to direct the program and maintain familiarity with OHM personnel.

PROTECTIVE EQUIPMENT

The following is a list of protective equipment used by OHM and a brief description concerning the general properties of each.

Protective Clothing

Acid King Fully Enclosed Suit: constructed of PVC on polyester; provides best protection against direct contact with acids and alkalies.

Acid Wear: bibs and jacket — constructed of PVC on polyester or nylon and serves best as a splash suit providing protection against direct contact with acids and alkalies.

Butyl Rubber Fully Enclosed Suit: con-

structed of butyl rubber on nylon; provides protection against direct contact with chlorinated solvents.

Rain Gear: bibs and jacket — constructed of PVC on nylon. This suit is lightweight and provides protection against dilute acids and alkalies and is usually worn over other protective clothing (disposal suits).

Chemical Waders: designed for use with a wide variety of chemicals; allows the wearer to wade through pools of material with maximum protection.

Fire Proximity Suit: constructed of fire-resistant material and fully enclosed, allowing the wearer to work in close proximity to a fire with maximum protection.

Bomb Suit: this suit provides torso, head, and leg protection when transporting potentially explosive materials. Constructed of heavy-guage metal, this suit affords the wearer maximum protection.

Disposable Coveralls: constructed of spun-bonded olefin; can be coated with polyvinylidene chloride. These suits provide excellent protection agaisnt a wide variety of chemicals, can be disposed of or laundered, and are available in enclosed models with hoods and boots. These suits are usually worn beneath a splash suit.

Robar Boot: constructed of natural rubber; provides protection against acids and alkalies.

Tingley Boot: constructed of neoprene; provides protection against acids, alkalies, and solvents.

Acid Gloves: constructed of neoprene and worn in conjunction with the acid bib and jacket. These gloves are sealed to the acid jacket by means of an interlocking glove/ring assembly, forming a barrier to chemical hazards.

PVC Gloves (Monkey Grips): these gloves are customarily worn over the acid gloves to provide protection against rips and tears.

Sample Gloves: these gloves are primarily worn beneath the acid gloves (or other gloves) as a secondary measure to protection. Sample gloves are also used in obtaining samples to prevent any cross-contamination.

Respiratory Protective Equipment

Self-Contained Breathing Apparatus (SCBA): OSHA-approved U.S. Divers' Association breathing apparatus, consisting of a high-pressure breathing air tank (5,000 psi) in conjunction with a constant pressure regulator with low-pressure alarm and low-pressure air hose connected to a full-face mask. This system allows for 30 minutes of breathing air.

Manifold Breathing Air Supply With Egress Pack: OSHA and U.S. Divers' Association-approved manifold air system (Scott), consisting of constant pressure regulator, 5-minute emergency escape bottle, and full-face mask. By means of a cascade system, 100-pound bottles of breathing air are regulated into several air hoses supplying multiple workers with a constant supply of breathing air. "Anick connectors" allow for fast disconnection if an emergency should arise.

Full-Face Respirator: OSHA-approved American Optical full-face respirator that protects the wearer's face and eyes from potentially hazardous chemicals.

American Optical has available a wide variety of cartridges offering protection from a multitude of respiratory hazards.

Half-Face Respirator: OSHA-approved American Optical half-face respirator that offers respiratory protection from a wide variety of hazards when used in conjunction with the proper cartridges.

General Safety Equipment

Head and Eye Safety Equipment: Hard hat, face shields, and goggles are standard safety equipment offering maximum head and eye protection to the wearer.

ANALYTICAL CAPABILITIES AND AVAILABLE EQUIPMENT

O.H. Materials Co.'s Technical Services Laboratory, Findlay, Ohio

OHM's Technical Services Laboratory, Findlay, Ohio is responsible for the analyses of a wide variety of samples generated from private industry and chemical dump sites. Analyses are conducted on waer, sediment, soil, sludge, and other sample types for a wide variety of priority pollutant and non-priority, pollutant-type compounds.

The analytical methods employed conform to USEPA published procedures and use advanced techniques such as fused silica capillary chromatography.

The major function of the laboratory is to supply the contractor with documented quality data. To perform this task, the Technical Services Laboratory has implemented a quality-control program which can facilitate the use of USATHAMA or USEPA quality-control guidelines.

OHM's analytical services are keynoted by high quality and rapid turnaround time. The laboratory provides both qualitative analyses, utilizing state-of-the-art identification procedures not commercially available, and quantitative analyses for specific compounds from virtually any sample matrix.

OHM maintains, uses, and develops specific analytical protocols. The laboratory maintains all of the current promulgated government analytical procedures as well as consensus procedures. Since very few procedures have been promulgated for hazardous materials (wastes) analyses, the laboratory has developed and utilizes, on a routine basis, specifc state-of-the-art analytical procedures.

Areas of specialization include the following:

Hazardous Materials Analyses (and other complex matrices)

- Trace component identification by GC/MS and component profiling using high resolution chromatography
- Toxic and hazardous materials analysis
- RCRA, TSCA

Oils, Sludges, Tars, Polymers

- PCBs
- Cyanides, etc.
- Trace contaminant identification

Water Analyses

- Priority pollutant screening via GC/MS or total screening and component identification
- Heavy metals
- Pesticides, herbicides
- PCBs
- NPDES

Air

- Ambient air monitoring (rapid turnaround for safety applications)
- Particulates — organics and inorganics
- Plume analysis

Other Services

- Treatment studies
- Compatibility of unknowns (for waste disposal)
- Liquid chromatography/mass spectrometry (LC/MS) for high molecular weight species
- Site tracer studies
- Consulting in all of the above areas

The following is a representative list of equipment used in this laboratory:

- Finnigan 400 Gas Chromatograph/Mass Spectrometer/Data System (GC/MS/DS) with Pulsed Positive-Negative Ion Chemical Ionization, Liquid Chromatograph/-Mass Spectrometer (LC/MS Interface, and Magnetic Tape Drive)
- Finningan 1020 OWA Gas Chromatograph/Mass Spectrometer/Data System
- Hewlett-Packard 5880 Gas Chromatograph (H-P 3388 Data System) with Packed and Capillary Inlets, Flame Ionization Detector (FID), 63/Ni Electron Capture Detector (ECD), Nitrogen Phosphorous Detector (NPD), and Hall Electrolytic Conductivity Detector (Hall)
- Tracor 560 Gas Chromatograph (H-P 3390 Data System) with Packed Inlets, Flame Ionization Detector (FID), 63/Ni Electron Capture Detector (ECD), Hall Electrolytic Conductivity Detector (Hall), Alkalai Flame Ionization Detector (AFID), and Flame Photometric Detector (FPD)
- Tekmar Liquid Sample Concentrator LSC-2 (Purge and Trap)
- Altex 420 High Pressure Liquid Chromatograph (HPLC) with Gradient Unit, Hitachi 100-40 Spectrophotometer and Schoeffel FS970 L.C. Fluorometer (H-P 3390 Data System)
- Instrumentation Laboratory 451 Video S Atomic Absorption/Atomic Emission Spectrophotometer with 655 Controlled Temperature Furnace (CTF) and Hydride Generator (AVA)

- Instrumentation Laboratory 257 Double Beam Atomic Absorption/Atomic Emission Spectrophotometer with 555 Controlled Temperature Furnace (CTF) and Hydride Generator (AVA)
- Orion Ionalyzer/901 with Selective Ion Electrodes
- Tektronix 4051 High Resolution Graphics Computer capable of storing, retrieving, and analyzing USATHAMA data points.

O.H. Materials Co.'s
Field Analytical Service

OHM's Field Analytical Services offers analyses pertaining to the nature and extent of contamination resulting from a spill or long-term contamination problem. To meet these analytical needs, OHM maintains mobile laboratory facilities.

Various levels of monitoring, ranging from field chemistry testing kits to sophisticated analytical instrumentation, are available for rapid data gathering. Fully-staffed mobile laboratories are available to be dispatched when rapid, precise, and accurate analyses are needed. The mobile laboratory facilities are staffed by highly trained chemists and can be operated on a 24-hour-per-day, 7-days-per-week schedule, if necessary. This work schedule eliminates sample transportation and offers rapid turnaround and cost effectiveness for high-volume analyses.

The field laboratories are redesigned 42-foot box trailers with air-ride suspension for safe transport of instruments and equipment. The standard functional advantages of an OHM field laboratory include glassware and equipment to support high volume extraction and/or digestion of soil, air, sludge, and water samples; 25 feet of chemically resistant countertop; safety features consisting of a shower, eye wash stations, and first-aid kits; two 5-foot fume hoods; storage capabilities for 250 gallons of water; and six gas cylinders, each equipped with purification systems. The water purification system, comprised of ion exchange and carbon beds, supplies analytical grade water throughout the trailer. These units are capable of sustained operation for long periods of time at remote locations and can accommodate up to three analytical chemists at any one time.

The proven versatility of our chemists and trailers provide site managers and clients the ability to make immediate decisions based on the scientific facts gathered and analyzed.

The equipment available for field analytical monitoring includes, but is not limited to:

Gas Chromatograph/Mass Spectrometer
Gas Chromatograph
Atomic Absorption Spectrophotometer
Liquid Chromatograph
Total Organic Carbon Analyzer
UV-VIS-IR Spectrophotometer
Tektronix 4051 High Resolution Graphics Computer

The mobile field laboratories employ the same extraction/wet chemistry methods, analytical techniques, and quality-assurance programs as offered by the Technical Services Laboratory in Findlay, Ohio.

Mobile Gas Chromatograph/
Mass Spectrometer Laboratory

A mobile field analytical laboratory was specially designed to perform hazardous waste site assessments. One of the key components and capabilities of the laboratory is a Gas Chromatograph/Mass Spectrometer (GC/MS) system to perform rapid specific contaminant identification on a variety of sample matrices.

A typical sampling and analysis routine includes on-site analysis under strict quality control documentation procedures. The samples would then be sent to an off-site laboratory for extraction and analysis; typically, 2 weeks are required before the results are known. A major hazardous waste site cleanup and closure operation, however, requires continuous and rapid monitoring of all stages of the operation to ensure the safety of personnel and the completeness of the project. Results are needed within hours, or, at the most, in 1 day.

In order to maintain the full capabilities of a GC/MS, a Finnigan OWA GC/MS with computer data system was installed in a modified 42$_9$ field analytical unit. The complete system includes an air-cushion shock absorber ride system to reduce potential problems in shipping the fragile com-

puter components, a microprocessor-controlled constant-voltage power supply and spike suppressor system for smoothing the elecrical current, a recirculated chilled water system for instrumentation cooling, adequate space for safe and proper operation of the instrumentation, and an organic area with fume hoods and lab-quality water for the extraction of soil and water samples. Two heating/air conditioning units were also required to handle the heating load produced by the computer and mass spectrometer systems.

With the present design configuration, little additional "packing" is required in order to ship the instrument from one location to another. This not only reduces installation time upon arrival, but reduces the possibility of breakage of delicate components through excessive handling; the units are simply strapped to the wall for shipment.

THE OHM MUST PROGRAM (Management of Underground Storage Tanks)

Many underground storage tanks installed in the '50s & '60s are approaching the final stages of their projected lifetime.

To ensure that these tanks are properly maintained, OHM has developed a flexible program called the OHM MUST PROGRAM which can be tailored to the specialized needs of manufacturers, utilities, medical institutions, transportation companies, service stations, or any facility which stores products in underground tanks.

Based on your requirements, OHM technicians will recommend the element or combination of elements in the OHM MUST PROGRAM that will meet your specific needs. The key services available through the OHM MUST PROGRAM are leak testing and monitoring well installation. If you have underground tanks storing fuel for power systems, fuel sampling and fuel filtering are components you may also wish to consider.

By implementing the OHM MUST PROGRAM, you can:

- Detect and address potentially costly underground leaks
- Forestall or halt groundwater pollution
- Assure the quality of your product and the efficient operation of power systems
- Ensure you will be in compliance with guidelines set forth by Federal and State Environmental Regulatory Agencies as well as with Local Ordinances

In the event a leak is detected, we offer effective remedial action such as containment and recovery of lost product, tank removal/replacement, and site restoration. We also have the experience to plan and/or manage your total underground storage tank operations.

For firms with large fuel inventories, such as phone companies, OHM also offers and *on-going fuel management program.* OHM technicians inspect underground tank sites at pre-determined intervals and take samples of both the fuel in the tank and the monitor well (installed in previous stages of the OHM MUST PROGRAM). Following sample analysis, on an as-needed basis, remedial action is recommended and carried out.

Fuel inventory control is maintained via computerized inventory levels as well as by fuel movement from tanks with low demand to tanks needing fuel.

O.H. MATERIALS CO. FACILITIES

OHM currently has service centers at the following locations:

- Atlanta, GA
- Baton Rouge, LA
- Findlay, OH
- Grand Rapids, MI
- Lexington, KY
- Minneapolis, MN
- Orlando, FL
- Ottawa, IL
- Sacramento, CA
- Trenton, NJ

The Company can be contacted 24 hours per day, 365 days per year, by calling its toll-free number 800-537-9540; in Ohio, call 800-537-5660.

Mr. Graziano: That's the company that brought you this presentation. I would be more than happy to answer any questions that you may have regarding how to handle

hazardous materials in derailments. Thank you.

President Budzileni: Any questions from the audience? No. Thank you, Mr. Graziano and Mr. Bessey, for that very interesting and timely special feature. Mr. Bessey, will you introduce the next special feature.

Mr. Bessey: Thank you, Robert. That was excellent. Our next presentation is "New Approach to Installing Hump Scale" which deals with installing a pitless scale in Conrail's Yard in Indianapolis. There is an article dealing with this scale installation in the September edition of *Progressive Railroading*. The presenter, Mr. Fred Day, System Engineer-Structural Maintenance, Conrail, really needs no introduction. Fred is an A.S.C.E. Fellow, member of AREA Committee 6 and past chairman of Committee 6, and is a registered Professional Engineer. Fred received his Degree in Civil Engineering from Brooklyn Poly Tech, and it seems like Fred has worked for a lot of companies like Pennsylvania Railroad, Penn Central and Conrail, which of course are all the same company. Over the years Fred has been involved in building design and maintenance and scale maintenance and construction, with a total of 43 years for the above three companies. Mr. Fred Day.

Conrail's Pitless Scale

by F.D. Day

System Engineer-Structural Maintenance
Conrail

Good morning, everyone. Today I take up a subject that is not as familiar to most maintenance of way railroad people as track or bridges or buildings. I am going to talk about track scales.

In particular about a certain type of track scale, one located at the hump at Conrail Big Four Class Yard, Avon, Indiana, a few miles west of Indianapolis.

Whether everyone here realizes it or not, all, and I say all, railroad revenue is based and has been based for a hundred years, on how many pounds or tons we haul. We collect freight revenue on a strictly weight basis.

On yes, we now have unit trains, piggyback trains, minimum trains, orange juice trains, produce trains, and so on, but they all go back to either measured weight per car or an agreed upon average load per car.

Now one of the most recent developments in commodities has been very expensive, say $10 or more a pound, for plastic pellets, hydroflouric acid (remember that stuff in high school lab that was kept in a wax bottle because it would eat right through a glass beaker), and, of course, all the expensive petroleum derivatives that turn into polypropylene, rayon stockings, and just about everything else including Corvette fenders.

Well, somebody has to measure all these things. We do it with track scales either owned by the railroads or owned and located on industry plants.

I made a survey back about 1970 for the AREA Scale Committee on scales and found over 6,000 track scales that were being tested by railroad scale inspectors. At that time Penn Central had 900 scales tested, 200 of which were Penn Central-owned. With the consolidation of our railroad, changes in traffic patterns, and more investment in scales by industries, the Conrail ownership is down to 89 of 500 total inspected.

Because it costs plenty of money to haul cars around, weigh them, and then bring them back, because it costs plenty of money in a big industry to wait for the railroad to come, take the loaded cars away, take them to a scale, and then assemble the cars, more industries build their own track scales, so they can forward billing before the cars leave the plant. All these industry-built scales are tested and calibrated by railroad scale people using, for the most part, railroad-owned test cars. As far as railroads are concerned, the less handling we have to do the more efficient the operation.

How To Do Less Handling

Weighing thirty cars one at a time and uncoupling one end as each car is weighed was the orignal method of car weighing. Then we tried drifting a car at a time over a scale and trying to get a quick reading.

Next we came to coupled-in-motion, handling a large number of cars across a scale without stopping. The most accurate way to weigh, in my opinion and experience, has been to get a single complete car one at a time on a scale, and the most efficient and most accurate way to weigh, is with a big, long, scale on a hump.

Big Four Hump Scale

By eliminating a few side track scales around Indianapolis and by catching cars going west to St. Louis at Indianapolis rather than weighing inefficiently at New Jersey or Philadelphia or other locations, the decision was made to invest in a hump scale at Avon Big Four Yard.

The scale was planned and estimated in

the conventional manner as a one-hundred-five foot scale in a big concrete box. To build the scale under traffic, 2,100 cars per day on a single track hump, required a fill to widen the hump, a runaround track, relocating the so-called pin retarder at the top of the hill, and, of course, temporarily relocating the master retarder at the bottom on the hill to say nothing of the radar speed controls, the light beam car count controls, the hump light towers, and so on.

After the box is built it is usually dark, damp, and subjects the steel weigh bridges to accelerated deterioration. But that's the way hump scales are built under traffic. Much nicer to build the hump scale when you build the yard — no traffic to worry about.

I happen to have a particularly single-minded operating vice president. He said, "I want you to build a scale on a trestle on a hill, and do it without a runaround and without disruption of traffic." I, along with others, said this was not practical. The scale would vibrate, the trestle would shift, the weights would be poor, I don't recommend it. "Do it and make it work" he said, "or you can't go to the scale meeting in Sacremento." This was last summer, 1983. Well, I especially wanted to go to Sacramento to that scale meeting, and more especially since my daughter and grandchildren lived near Sacremento, so I capitulated to this blackmail and in a week layed out the design for the Big Four Pitless Scale. From there one of the boys in the back room took over and transformed my five 8½-inch X 11-inch sketches with steel sizes into 22 sheets of plans in about six weeks.

Construction Procedures

We went out for bids on the structural steel bridges, got promised delivery for the middle of October, and started to drive piles one day a week at four to seven hours a shot. Now, I am going to show you the slides as we go along and interject comments.

Pile driving was done by our B&B forces, foreman and seven men, at Big Four Yard using Conrail pile driver and leads. We rented a second set of leads and a heavier hammer to push down the extra heavy piles at the ends of the scale bridges where the approaches meet the scale.

From July 12 through August 30 (45 days) last year we drove 53 piles, maximum day was 11 piles; maximum day was 9½ hours with two pile drivers, both Conrail owned.

My own contribution to the pile situation was to use very heavy piles, 152 lb. per foot, to use pile spacing that avoided disturbing the hump track by putting a single pile in the center of the track with a plumb pile five feet from center line, each side to be beyond end of tie, and then a batter pile at each outside plumb pile — five piles installed at seven bents.

Naturally we had to have everything at each bent in a straight line and the batter pile cut-off location at the right elevation, nine feet below track level and out of sight.

On days when the gang could not have the use of the hump track — this was most of the time — we poured the concrete abutment slabs that would be dropped between the vertical piles at the end of the approaches. The gang also had other jobs in the yard.

The structural steel for the four weigh bridges and the two approach bridges, 100 feet of weigh bridge, 140 feet overall, was fabricated for complete bridge delivery; six spans — each span came complete with deck and rail plates ready to be placed on the pile caps. Sidewalks were added in the field after erection. The bridges arrived at the end of October last year.

Then came the big decision. When will we dig out the hump and build the scale? With a little help from my Friend on the floor above me, I was able to guide the answer to Thanksgiving Friday, Saturday, Sunday and possibly Monday, if we should have rain, rather than Christmas week. If you all remember, the temperature went down to 15° below at Indianapolis Christmas week. It was 65° the day after Thanksgiving.

The bridge steel was unloaded ahead of time along the south side of the hump. On dig day we had a contractor start under lights at 2:00 a.m. with his big dozers and small front end loaders. He had the 1,400 cubic yards out and all piles exposed by 7:00 a.m. In five hours he had moved all the dirt

to the north side.

From there on we set grade on the piles, cut off the piles, tack welded the caps to the piles, landed the bridges, and welded all night Friday on the pile caps. On Saturday at noon, we dragged the rail back up onto the steel bridges, surfaced the approaches, and by 7:30 p.m. Saturday evening put the hump back in service with an outage time of only 41 hours.

I must explain that we did not install the load cells nor did we cut the welded rails at that time.

The remainder of the work required digging in conduit for the load cell cables, installing load cells, continuing with the footwalks, a lot more welding, and finally on January 18th this year, we tested the scale and put the scale in service.

Scale Details

There are a few special details about this scale. First, it has no pit, but it does have a steel skeleton that simulates a pit. The horizontal strut bracing between pile bents is the floor. The big columns under the sidewalk are the sidewalls that are used to hold the horizontal check rods that keep the weigh bridges from side sway. The enormous 283 lb. piles at each end of the 100-foot weigh scale are the end walls where the approach beams land and on the upper end where the big check plate is fastened to keep the weigh bridge from going down the 2.40-percent grade when the engines apply brakes.

The load cells have a bottom attachment to provide a spherical ball matching the top ball on the load cells. This arrangement gives point bearing top and bottom and eliminates the rigid requirement of a perfectly plumb load cell on a flat square base.

Finally, none of this could be done without the boys in the backroom for plans, Rich Check and Jim Zito, the gang in the field, John Tolin, Conrail B&B Supervisor, and Contractor, Don Engle, Jay Boggs, Tom Picton and most important, yard superintendent, Mark Owens, who put up with us and gave us good cooperation to get the work done.

If you have any questions as to cost, steel tonnage, or test results, I'll be happy to try and answer them. Thank you.

President Budzileni: Thank you, Mr. Day for that special feature. Mr. Bessey, I appreciate your choice of special features. At this time I would like to turn the rostrum over to Mr. Meek.

President Meek: Thank you, Jim. That was a very nice presentation Mr. Day. I enjoyed that. At 10:00 a.m. this morning, our registration was 137 for Roadmasters; 66 for B&B; 129 associates; 39 guests; and 69 ladies, which is a fair turnout, for a total of 440. Now this year we were not able to get set up with our registration on this floor due to other conflicts, and some of you may not know where to go to register. It's up on the sixth floor. And if you want to save yourself 20¢, you can pay your next year's dues while you're up there. You'll notice these yellow cards on the chairs, and we encourage everybody to take those, and fill them out, and return them. These are subjects that we're going to have for the conference in Dallas next Fall, with both organizations and at the same time we're asking for anybody that has any suggestions about subjects to please write them down so we can go over them when we start selecting our subjects for two years from now. It means a lot to us to have good subjects. Now on your program it shows that the Roadmasters will meet at 1:15, lets make it 1:30. I'm not going to talk for 30 minutes. Allright, at 1:30 the Roadmasters will meet back here in the Red Lacquer Room, and the Bridge and Building people will meet in the Adams Ballroom on the sixth floor. President Budzileni, do you have any announcements to make?

I declare this session adjourned.

MONDAY AFTERNOON
September 24, 1984

President Budzileni: Will everyone please be seated and will someone advise those in the foyer that the Bridge and Building session is going to begin. Please close the doors. Thank you.

Good afternoon everyone. I hereby bring this, the 89th Annual Conference of the American Railway Bridge and Building Association, to order. On behalf of the Association officers and myself, we extend a warm welcome to all members, guests, and friends.

It is now my pleasure to introduce the executive members of your Association. Will you please stand as your name is called. We have a few guest speakers who will be introduced later in the program. Please withhold your applause until all have been introduced.

On my extreme right, W.C. Sturm, Senior Project Engineer, Elgin, Joliet and Eastern Railway Company, Joliet, Illinois. Wally is chairman of the Hotel Arrangement Committee. Being a past president also makes him a member of the Nominating Committee.

Pat Weissmann, Secretary of the Bridge and Building Association, Homewood, Illinois. Pat is chairman of everything, including taking care of items we forget.

Director T.E. Kuhn, Bridge Construction Engineer, Missouri Pacific, St. Louis, Missouri. Tom is sponsor of Special Subject No. 3.

Director B.T. Burns, Steel Bridge Inspector, Atchison, Topeka and Santa Fe, Topeka, Kansas. Byron is chairman of B&B Committee for Equipment and also serves on the Resolutions and Ladies Activities Committees. He is also the sponsor of Special Subject No. 2.

Junior Vice President J.T. Kapp, Staff Engineer Construction, Conrail, Philadelphia, Pennsylvania.

On my extreme right, Director J.W. Davidson, Assistant Chief Engineer-Design and Structures, Burlington Northern, Overland Park, Kansas.

Director R.A. Tallent, Process Engineer-Structures, Southern, Atlanta, Georgia.

Director W.J. Semioli, Editor, Railway Track and Structures Magazine, Chicago, Illinois.

Junior Vice President D.A. Bessey, Assistant Chief Engineer-Structures, Chicago, Milwaukee, St. Paul and Pacific, Chicago, Illinois.

Senior Vice President J.M. Williams, Supervisor Bridges and Buildings, Elgin, Joliet and Eastern Railway Company, Gary, Indiana.

(Applause)

As required by the By-laws of our Association, I must render a report as to the general condition of the Association. Our current membership is 736. This is an increase of 21 members over last year. Of the 736 only 556 members pay dues and carry the burden for the Association. As you know, the last few years have been rocky ones for the Association for various reasons: consolidation of many railroads, force reductions, and the general economic conditions of the country. We have raised the dues, and hopefully they will remain at this level for a few years to come. Your Executive Committee is also looking into registration fees as a method of increasing revenues. The $20 we charge for two and a half days conference is not a large sum compared to other seminars and conferences we have all attended. The committee is also looking into raising our advertising revenue, which would pay for the Proceedings. Unfortunately, in the past few years, it has not. At this time I would like to make an appeal to each and every one of you, as you go about your daily routine, contacting people, ask them about advertising. If they are interested, send their name, address, and telephone number to the office in Homewood, and Pat will follow up.

This Association needs your continued contributions of technical papers and volunteers to address these sessions. This is the way we will be able to keep a strong Association.

Now to get on to the more pleasant part of the program!

Special Subject No. 2 will be introduced by its sponsor Mr. Burns.

Mr. Burns: Thank you President Budzileni. The first special subject this afternoon will be Special Subject No. 2, Installation or Replacement of Culverts. The speaker will be Mr. W.J. Gunkle, Senior Structural Inspector from Conrail, Philadelphia, Pennsylvania. Mr. Gunkle began his railroad career with the Pennsylvania Railroad in 1939 and has evolved as an employee of Conrail. He's probably known to many of you since he has been a member of the American Railway Bridge and Building Association since 1966, serving as a director of the Association from 1976 through 1978. He is also a member of the American Railway Engineering Association and a sub-committee chairman on Committee No. 7. It gives me great pleasure to present Mr. W.J. Gunkle. Bill.

SPECIAL SUBJECT NO. 2

Installation or Replacement of Culverts

Chairman: W.J. Grunkle, Sr. Str. Insp., Conrail, Philadelphia, PA

Committee: E.B. Dobranetski, Engr. Fac. & St., B&LE, Monroeville, PA
P. Longiotti, Supv. Str., B&LE, Greenville, PA
E.T. Jaatteenmake, Engr. Tech. Spec., CP Rail, Revelstoke, BC
V.J. Rankel, Asst. Gen. Br. Engr., C&NW, Chicago, IL
R.J. Wright, Engr. Br. Dsgn., Milwaukee Road, Chicago, IL
D.O. Cochran, B&B Supv., Southern, Wilton, AL
R. Evans, ARMCO, Chicago, IL
G.L. Tysinger, Tysinger Engineering, Erwin, TN
E.E. Runde, Const. Engr. (Ret.), ICG, Chicago, IL

There have been a number of important developments in drainage practice and in the available materials and products to solve drainage problems. These new developments are principally in the field of subgrade stabilization and culvert design.

There are two primary sources of water. A portion of this water seeps or percolates through the ground to form part of the stationary supply. A second part of the precipitation flows away over the surface to small streams and then to larger streams. Part of the water may remain standing on the surface until removed by evaporation or artificial means.

Drainage can then be defined as the science of directing the removal of excess surface and ground water in such a manner as to safeguard and promote the best interests of all concerned.

Need for Drainage

With the beginning of the era of industrial expansion, many new applications were found for drainage. One of these was the safeguarding of foundations. It was known that the bearing power of soils of all kinds was greatly reduced by the presence of excess moisture. Diversion of surface water and drainage of ground water from the vicinity of bridge abutments, building foundations, and roadbeds soon became one of the most important railroad services rendered by drainage.

Drainage to protect railroads finds perhaps its largest application under railroad roadbeds. Because of their physical characteristics, modern rail lines would be unknown to us if means of preserving their stability and protecting them against washout had not been developed through drainage.

Geological formations are such that nature alone, or the construction of engineering works, frequently disturb their equilibrium which can result in landslides.

In most cases, water in one form or another is a contributing factor, so that drainage alone, or in conjunction with another vehicle, is necessary in restoring equilibrium.

The full importance of that unseen servant, drainage, is realized by few. Perhaps this is because the structures are hidden away, or because we have become so used to the higher standards of living, resulting from dry surroundings, durable and safe engineering works, and smooth railroads, that we are oblivious to the contribution of drainage.

The number who are aware of the vital necessity of drainage is increasing steadily. However, each year the public demands more protection through the construction of drainage improvements.

The aim in railroads is to prevent water from standing on the surface. The first step is crowning or sloping the surface to shed the water. The second step is to concentrate the water in a depression, ditch, or gutter parallel to the center line of the roadway, then into the nearest cross stream. Usually these parallel ditches or gutters are adequately designed, so that no water will remain on the surface to cause injury to the road bed.

One of the most destructive forces to combat is that of soil erosion. Erosion forms gullies on the shoulders and slopes of earth embankments, gouges outside ditches endangering the roadbed foundation, undermines causing land slides on the backslopes of side hill cuts, washes out drainage structures, and fills and clogs culverts and other waterways with sediment. Open ditches are subject to erosion, sedimentation, change of channel, and overflowing.

Culverts are used to enclose streams and support the road bed above. They are to be found where natural or artificial streams intersect a roadway, at the bottom of depressions and other intersecting roads, and at entrances where they form a part of the side ditch.

When the water table remains at such a height that it reduces the stability of road beds, railroad yards, and terminals, it becomes necessary to use artificial means to lower the water table. This may be done by tapping the underground reservoir to provide an outlet or by accelerating the movement of the water away from the critical areas. Ground water must be intercepted before reaching the area it affects adversely.

A very appreciable portion of the annual outlay for construction and maintenance is spent for drainage facilities. Obviously, it is important that there be research into the materials used in the production of culverts and in the proper methods of constructing culverts. Until about two decades ago, there had been but little research of this nature. While research has gained momentum with regard to volume and scope, it needs to be pursued more diligently and extensively if it is to safeguard the number of dollars invested in construction projects. The need for quicker and more thorough dissemination of the results is of greater importance than the research itself.

The introduction of high speed and heavier freight trains have made stronger track construction and improved maintenance necessary. Drainage has been, and is, an important factor in making these improvements possible. New drainage construction and replacement of failing and temporary structures require an expenditure by railroad interests each year in the millions of dollars.

Culverts

In the past, types and materials were selected largely by empirical methods when complete data was lacking. The design engineer would use the facts which were available, but not all of the facts regarding strength, durability, and economy were fully known. Two things are essential in design. Selection of the type and material for the drainage situation based on suitability, ease of construction, durability, and cost, and determination of the required size, shape, and strength. Each depends on the other. Other problems that require consideration are: traffic interference during installation, adaptability of removal and installation, availability, and reputation of the manufacturer. The design engineer should assign a value to each of the above, insofar as it is possible, and determine which material will be the most advantageous in the particular application for which it is specified.

Design Factors

Determination of culvert sizes does not ordinarily lend itself to mathematical precision. Rainfall expectancy, slope and shape of drainage area, character of vegetation, character and condition of soil, and other variables all can form an infinite variety of combinations which defy exact determination. The most practical method of determining the proper size of a culvert is to investigate the old existing structure and to make a drainage suvey, to see how much water it was required to carry. Where no culvert exists, it may be possible to make such an examination of old culverts either up stream or down stream from the proposed site. Sufficient allowance or factor of safety should be added incase old railroad records are doubtful or not extended over a period of years.

The required length of a culvert depends on the width of the roadway from shoulder to shoulder, the height of the fill, the slope of the embankments and the slope and skew angle of the culvert. It should be amply long so that it will not be in danger of filling up with debris from the embankment during rains. A culvert that is too short is not economincal because of the impaired efficiency and increased maintenance. The best method of determining the length needed is by a cross sectional sketch of the embankment and a plan and profile of the water course. The proper location of a culvert is important because it affects the adequacy of the opening, maintenance of the culvert, continuity of service, and possible washout of the railroad. Every culvert installation is a case in itself. It is well to remember that an open stream is not always of a stable character.

Loads transmitted by granular fill materials vary greatly with variations in the properties of the fill materials, as to weight, settlement, moisture, temperature, and cohesion. In addition to the vertical and side pressure on ground structures, there also are transverse pressures. These pressures are caused by the action of gravity or superimposed weight and manifested by the tendency of the soil to move downward and outward seeking equilibrium or its angle of repose.

The result, in the case of a structure in a long trench, is of much less importance than in the case of a structure under an embankment. The effect is exhibited in the disjointing of short sectional pipe and in the pulling apart of rigid monolithic culverts which have cracked under load.

When corrugated metal pipe proceeds to failure, it is made evident either by a change in shape or by pulling or shearing of the rivets and not by cracking or breaking. Change of shape is a result of deflecting under load and for various diameters and fill heights is a function of the gauge or thickness of the metal. Futhermore, the strength of corrugated pipe cannot be determined by the usual bending moment formulas.

In regions subjected to cold climates, frost action creates enormous pressures on underground structures. Water, in freezing, increases approximately 9 percent in volume with the resulting expansive force being about 31,000 pounds or a little more than 15 tons per square inch. However, frost action is not a factor when dealing with flexible pipe since the pipe easily adjusts itself to any change in pressure.

Installation

For high fills on large diameter corrugated pipe that might cause more than 5 percent deflection, a method of installing the pipe known as strutting is employed to develop the full strength of the pipe and insure a true round appearance after the fill has consolidated.

Lengths of corrugated pipe can be joined in the field by several methods. The most common is to use a corrugated connection band or collar, 3 to 5 or more corrugations in width, to which the end sections of angle iron are riveted. By means of bolts through the angles, the band is drawn tight. Another method consists of riveting half of the connecting band on the lower half of one end of the pipe and the other half on the upper half of the adjacent length of the pipe. These are then bolted together. Another method is to field rivet which connects the joint with rivets, part of them being omitted in shop fabrication from the longitudinal seam to permit lapping appropriate where a pipe is to be installed by the jacking method.

Foundation

Every structure built must have some kind of foundation no matter how simple it may be. The trench in which the pipe is laid must be free from large stones and the backfill must be well tamped up to three quarters of the height of the pipe. For very soft and unstable foundation conditions, a gravel sub-base or some form of timber grillage will probably be necessary. Several types of foundation can be used, such as timber base, reinforced concrete base or concrete footings. Each foundation is chosen for its advantage depending upon local conditions, cost of materials, and service required. The timber base and reinforced concrete base differ in design principle from the footing type where each edge of the culvert is independent of the other. In every case, it is necessary to determine the vertical and horizontal reaction before an intelligent foundation can be constructed.

Headwalls

Headwalls serve the practical purpose of anchoring and preventing the displacement of short sectional culvert pipe and of protecting the embankment at the inlet and outlet against erosion. Scour results from the velocity of water, the falling of water, and eddying action. Scour if unchecked will undermine a culvert and endanger the embankment above it. Precautions should first be taken to remove any obstructions or irregularities in the upstream channels which might cause scour or erosion.

In some sections of the country where small game is plentiful, much damage to culverts is caused by animals burrowing along the outside of the barrel. Head walls tend to prevent this and to minimize the chances of a washout due to such burrowing.

Construction Cost

Construction costs will vary in different sections of the country depending on soil, topography, climate conditions, labor efficiencies, wage scales, and construction practices. Therefore, when possible, costs should be given in man hours as well as in dollars and cents, and a complete description of the local conditions encountered should be given. Studies should be made to include all types of pipe of all sizes and under as many different conditions as possible. The various types of operations that need to be analyzed in determining the true installed cost of a culvert in addition to the material costs are: transportation, excavation and backfill, removing old structures, preparing the bed, and placing the new structure, replacing the track surface, equipment and use of tools, supervision, and the provision for detours or slow orders. All of these items may not apply to any one job, and others may sometimes be added, but generally the items listed above will cover the construction cost of an ordinary culvert. Culverts that can be installed in a minimum of time will naturally minimize train delays. In the final analysis, cost is a measure of efficiency.

Open Cut Installation

The open cut method is usually preferred due to cost, ease, and speed of culvert installation. In most cases a backhoe is used to excavate material and place the pipe. A level is used to establish the proper grade on which the culvert is placed and a compactor is required to provide a firm foundation for the culvert and to compact the fill material as it is placed around and over the newly installed pipe. The track should be surfaced with vibratory tamping equipment so that the train traffic can be allowed to run at maximum authorized speed as soon as possible.

Installation by Boring

Boring consists of the installation by the dry boring method of a smooth wall steel casting in diameters from 12 to 36 inches. The holes are mechanically bored and cased using a cutting head and a continuous auger mounted inside the casing pipe. The casing is installed simultaneously with the boring of the hole. The inside diameter of the casing pipe is generally at least 4 inches greater than the largest outside diameter of the carrier pipe. Boring methods that use water should not be permitted, as water injection under pressure can cause cavities which may show up immediately or months later.

Jacking

Installing pipe by the jacking method means that the earth ahead of the pipe will

be excavated by men using hand tools while the pipe is pushed through the hole by means of jacks, rams, or other mechanical devices. Care is to be taken to prevent the loss of soil which will create voids outside the pipe. The pipe must have a minimal amount of extra excavation outside it so that the pipe will not be shearing the earth as it is pushed into the excavated hole. Excavation ahead of the pipe will depend on the ability of the soil to stand without support, but at no time shall it exceed two feet ahead of the pipe. Water should not be used to loosen the material. The earth face must be bulkheaded whenever operations are shut down for more than two hours.

Tunneling

The tunneling procedure is used in openings 48 inches in diameter and larger. The excavation is carried on simultaneously with the installation of the tunnel liner plates. The excavation may be by hand or by mechanical means. The tunnel liner plates are installed immediately behind the excavation as it progresses and are assembled completely from the inside. Tunneling is a more dependable way of providing underground openings than either boring or jacking. The length of the tunnel is not limited by ground conditions.

Threading

Threading insures that a new culvert will fit into the existing culvert and can be placed with no obstacles. A shoe is placed on the front of the new culvert and an angle is placed on the back of the new culvert. A block with a sheave is placed on the end opposite to where the threading will begin. A winch cable is threaded through the sheave, and the cable connected to the angle on the end of the culvert with the other end of the cable connected to the winch. The pipe is slowly threaded with one man at the culvert to see that the new culvert does not bind. The winch can be a portable (hand), air operated, or connecting band. After the culvert is threaded, the ends of the culvert opening between the old and new culvert are blocked with brick, stone, or concrete. Grout or sand is pumped between the two culverts.

The crew size for the open cut culvert method is 4 men and an equipment operator. The crew size for a tunneling operation is 3 men. The crew size for a jacking operation is 4 men and a truck winch operator.

True Economic Cost

The true economic cost of installing a culvert involves a proper balance between the cost of placing and maintaining the culvert in service. It is quite possible that some materials which could be used command such a high cost that they would become uneconomical even though perpetual service could be expected.

Life Expectancy

There are three methods of determining life expectancy: laboratory tests, service record of failed specimens, and use of the law of averages of existing culverts. Field studies of actual culvert performance require the inspection of all culverts under a given number of railroads according to a previously determined program done by competent and unbiased inspectors. A written record of each culvert inspection includes a rating assigned to each culvert based on its present condition. An average life expectancy is computed for each culvert or material in each variation of service.

Durability investigations show that soils of different chemical characteristics have different effects on underground structures. The major chemical classification of soils and water are: alkaline, organic acids, acid mineral, salt and salt marsh, and mine waters.

The criteria that must be used when constructing or replacing a culvert have been presented. The method of construction and the constraints of time and money must be judged on an individual basis for each situation. Crew experience and the availability of materials all contribute to the decision making process which ultimately leads to the success or failure of any culvert installation.

Any questions?

Thank you. (Applause).

President Budzileni: Thank you Mr. Gunkle and Mr. Burns for that very interesting presentation.

Next on our program is a special feature from Japan, and Mr. Bessey is going to take care of that one for me.

Damage to Fujigawa Bridge of Takaido Main Line and Its Restoration Work
(Japanese National Railway)

presented by:

D.A. Bessey,

Assistant Chief Engineer-Structures, Milwaukee Road

D.A. Bessey

Mr. Bessey: Minasama noh, Egao mi teh, watakushi taihen ureshii desu. You did want me to do this in Japanese didn't you? (Laughter).

For those of you who don't understand Japanese, I said, "Thank you very much. Your faces smiling I see makes me very happy!"

Having the responsibility for putting together special features for this conference I had my eyes open for the last year or so and I saw an article in a 1983 publication edited and published by the Japanese Railway Engineering Association (JREA). I contacted Mr. Atsushi Murakami, who is Chief, Structure Maintenance Division, Track & Structure Department of the Japanese National Railway and later had correspondence with the managing director of JREA, Mr. G. Nishio, to get information in connection with the typhoon damage that occured to the Fujigawa Bridge and its reconstruction.

In Japan the visitation of typhoons is a commonplace meteorological phenomenon, and damage control against typhoons is an important task for the economical activity of the country and certainly is a major concern of all railroads throughout Japan.

The Japanese Railway operates approximately a 20,000-kilometer (12,500 miles) railroad system, and the typhoon that occurred in mid-summer 1982 did a considerable amount of damage to the entire railway system. A major catastrophe of extreme proportion was the excessive damage to the Fujigawa bridge crossing the Fuji River which is just southwest of Tokyo. The bridge collapsed on August 2 as a result of a record-breaking typhoon that did extensive damage throughout the country. The Japanese National Railway received a special citation from the Japan Society of Civil Engineers for their record-breaking restoration of the damage which was carried out in 75 days.

This presentation involves the damage to the bridge structure and the restoration process. Typhoon #10 started to build about 1,800 km or approximately 1,100 miles south of the main land of Japan in late July 1982. Some minutes past midnight on August 2, the typhoon hit the southern and central mainland causing extensive damage and the torrential rainfall resulted in extreme flooding of the major rivers of this area.

The Fuji River is a rather large river with a normal rapid current and approximately 90% of the Fuji River basin is a mountainous region.

The tremedous amount of floodwater inundated the Fujigawa Bridge structures, scouring out under Pier #4 of the southbound line, collapsing the pier at approx-

imately 5:00 AM on August 2. Two truss spans were washed away, and a pier and two truss spans of an abandoned bridge were also washed away.

(Whereupon there was a slide presentation with the accompanying remarks.)

Three bridges before the disaster (the typhoon No. 10)

The original bridge was constructed in 1888 consisting of 9-span Pownall type trusses of 63 meters or 208 feet in span on 35-foot diameter well-type brick and stone piers. I did some research to try to find out more about a Pownall type truss. The original 208-foot span was only 17 feet high. The truss was designed using intersecting diagonals with the horizontal member between the top and lower chord. It could best be described as a double Warren truss.

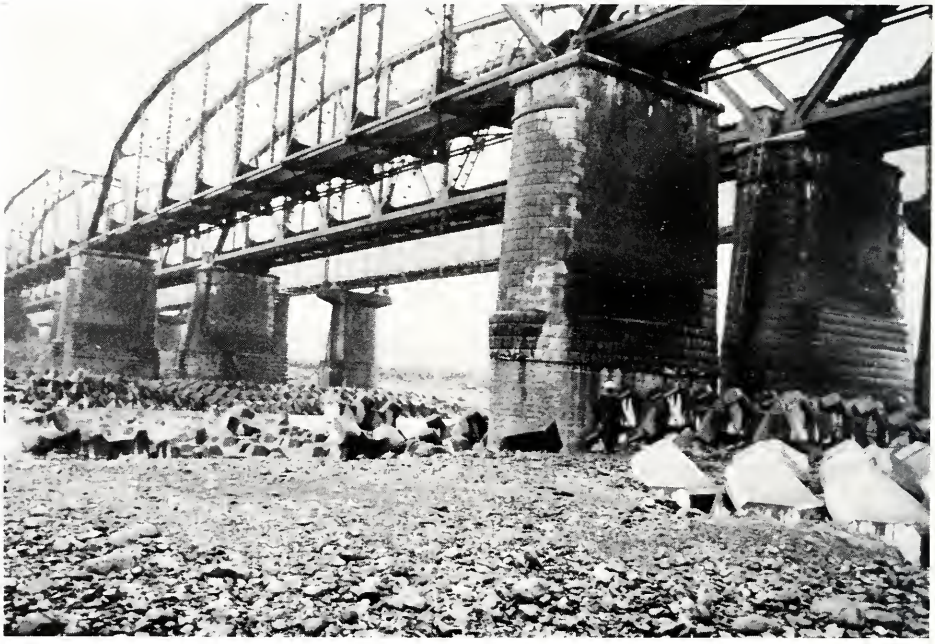
The second bridge was constructed in 1910 to carry southbound traffic, consisting of 9-204-foot-9-inch Schwedler type trusses on brick and stone piers. I also did a little research on Schwedler type truss which is somewhat similar to a Whipple, with double interacting laterals building up a lattice system.

I understand the Whipple truss was used quite extensively in the United States, but it is seldom used today. The Schwedler truss was suitable for long spans, and there was some economy in metal. However, it was not a thing of beauty.

The original bridge, used for northbound traffic, was replaced in 1915 with 9-205-foot Pratt type trusses. The bridge had a Cooper E-45 rating.

A third bridge was constructed in 1956 to replace the Schwedler type truss spans. The new bridge consisted of three sets of continuous "half through plate girders" of 3-208-foot spans on reinforced concrete piers. The "half through girder" design was used to give passengers a better view of Mt. Fuji, the most famous mountain of Japan.

So of the three parallel bridges, the new through girder span was for northbound trains, the 9-span Pratt truss structure was for southbound, and the old Schwedler type truss span was abandoned.



A photo taken during a small flood before the typhoon, taken from a staging between the northbound and southbound spans.

During the disaster (the typhoon No. 10), in the morning of August 2, 1982

Note the great differences of level in the running water at the center part of the river and at the high water bed. The Pier 4 washed away is at the right edge of the photo.

During disaster (August 2, 1982)

This was taken from Pier 3 of the southbound bridge. The Pier 3 of the new bridge (righthand side) for southbound traffic, constructed in 1955, did not get washed away because of the deeper piles.

During the disaster (in the morning of August 2, 1982)

The truss No. 4 southbound bridge is washed away. The four trusses washed away are lying on the river bed. The remaining two trusses were assumed to be washed downstream as far as 600 meters (2,000 feet) on this side of the bridge and to be buried in the earth and sand. They have still not been found.

During the disaster after the water level was lowered (August 2, 1982)

The truss No. 4 was washed away from southbound line.

Removal of the trusses washed away

Stones and debris came from the upper stream by the flood. After the August 2 collapse of the southbound bridge and of the abandoned structure, an inspection was made of the northbound through girder span structure and it was found to be undamaged. Train service was resumed using the northbound bridge on August 4, operating 16 trains per day.

An automatic signal system was installed in approximately one week in the area from the bridge to Fuji station. The number of trains was then increased up to 210 per day or about 84% normal operation. Normal operation across these bridges was 250 trains per day. So you can see this was no branch line.

Stream detouring work

The pier No. 4 (the left bottom of the photo) lying at a right angle with the stream line evidently shows that it fell down, not by running water pressure, but by scouring. The working site was cut off from running water by detouring the stream.

Work period: 2 weeks

Number of bulldozers used: 50/day

Stream detouring work at the upper stream side

Twenty-ton concrete blocks were used as ripraps.

For construction of the new piers for southbound line, a temporary stage is being constructed, extending to the west, and boring tests are being conducted in order to check the depth to the supporting layer at the points where new piers are constructed.

After the completion of the stream detouring work, water that came in through temporary levees was pumped out continuously during the construction of new piers.

The pier No. 4 for southbound line lying on its side

No defects in materials or in the execution were found, and a high technical level at that time was reconfirmed. The old pier was built in 1890.

Removal (and demolishment) of the pier No. 4 for southbound line in order for reconstructing piers at the same positions as they were.

Excavating for new piers

Depth was 20 meters from the bottom of the footing. Inside diameter of the pile - 2 meters. Casing pipes were left buried.

Excavating

Performance of the excavating machine was 1.5 meters/day (5 feet-0 inches) average, because of hard rock and big stones. As if they didn't have enough problems, typhoon #15 hit on August 27 and then, on September 11, we have typhoon #18.

Because of water level rising caused by typhoon No. 15, the third typhoon having attacked the site, the restoration work was interrupted. The temporary embankment and stages were washed away.

After the typhoon No. 18

Three piles are under construction (a part of concrete has been already placed) and inclined steel casings for the protection of the steel bars.

After water level lowered, the work resumed without constructing a temporary embankment but relying only upon the blocks thrown around the piers for foot protection during concrete placing.

50 days after the disaster

The new pier was designed to be as thin as possible, so that the amount of scouring could be minimized.

Two trusses were constructed by using traveling cranes, extending from both pier

No. 3 and pier No. 5 at the same time during the construction of pier No. 4. In addition, the following measures were taken to shorten the time schedule:

1. Sending each piece of material to the site as soon as it is finished, omitting preliminary assembling in the factory.
2. Painting is to be made only once in the factory and three times at the site after construction; paint available for immediate repainting is to be used in the factory.
3. Torque-shear types of bolts for friction jointing use are to be applied to realize rapid construction without difficulty.
4. Construction works for two spans are to be started from No. 3 pier and No. 5 pier at the same time.
5. Construction work utilizing traveling cranes is to be done avoiding bent method or crane method in consideration of possible flooding during the reconstruction work.
6. As the understructure was nearly completed at the time the construction work reached the half way point, countermeasures for safety were established by burying H-section steel into the pier and stretching wires from the steel when strong wind is blowing. This H-sectioned steel is to be utilized effectively in the final stage of the erection work of the superstructure.

During restoration work for the southbound line, trains were being run on a single track with slow speed operation. Train speed was reduced to 50 km/h (30 MPH) at first; it was increased to 70 km/h (43 MPH) after danger of a flood was over.

Test run train on the new truss for southbound line

Measuring the deflections of the new beam.

After completion of the restoration

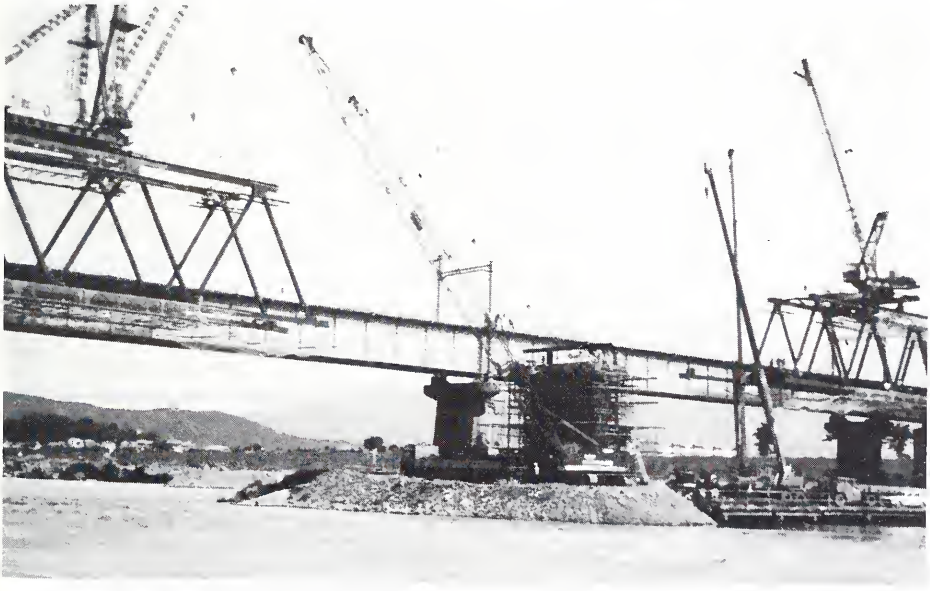
Foot protection work on the pier No. 3 and No. 5 by concrete piles.

Planting steel bar cages

Completion of the foot protection work on pier No. 3 and No. 5

Foot protection work by using concrete blocks for pier No. 2 and No. 3 against scouring of the river bed

Foot protection on the pier No. 3 by concrete piles (ICOS method) and concrete blocks.



Present situation
(As of December 1983)

Taken from the same position as No. 2 slide.

Completion.

Service resumption: October 15, 1982

Mount Fuji in the background.

The damages caused by the disaster were restored safely within a short period; however, there are plenty of problems left for the future.

JNR restricts train operations when any flood is foreseen, on the basis of the strength of the meteorological data, particularly in large river basin areas. Examples of overturning of bridge structures from scouring of riverbeds will give a formula to determine the necessary protection; however, there are so many different conditions, that it is difficult to make a conclusive judgement. Disasters of this type are difficult to predict as they are caused by a meteorological phenomenon more powerful in a sense than some of the destruction devices made by man.

I would like to extend my gratitude to the JNR and the Japanese Railway Engineering Association for furnishing slides and dialogue for this presentation.

Thank you very much. (Applause).

President Budzileni: Thank you, Don, for those very interesting slides and keeping your eyes open for all these interesting things for us.

Our next special feature should be of interest to all of us as it has to do with the high cost of energy these days. Here to make the introduction is Mr. Bill Semioli, sponsor of Special Subject No. 4. Bill.

Mr. Semioli: Thank you, Jim. Our next speaker dealing with Special Subject No. 4, Buildings Audits and Insulation is John H. Smith. John is a Building Engineer for the Illinois Central Gulf Railroad Company, and he also maintains an additional responsibility of energy conservation throughout the railroad system. John is a local Chicago man, he graduated from Chicago Technical College, and he has an Engineering Degree in architecture and structure. In March 1983 he asumed his current position of Buildings Engineer with the ICG, and he is responsible for the design and operations for all buildings for the ICG. John.

SPECIAL SUBJECT NO. 4

Building Audits and Insulation

by John H. Smith, Buildings Engineer, Illinois Central Gulf Railroad

Thank you, Bill Semioli, and good afternoon Ladies and Gentleman.

Historical Background

Energy — where do we go from here? A bit of history first. In the middle of the 19th century, the primary source of energy in the United States was wood. We had relied on that renewable energy source for many previous centuries. Also, in previous centuries, heat was the principal end use of energy. Mechanical energy was provided by animals, humans, or falling waters.

With the discovery of ways to convert heat energy to mechanical energy the industrial era began, and, with more forms of energy needed, the United States turned to coal. Coal began to displace wood as the principal fuel over the next 40-50 years. With the discovery of petroleum in the latter part of the 19th century, the merits of this energy source became apparent, and, over the succeeding 50 to 60 years, its use grew until it became our principal source of energy leading into the 20th century. Today, industry is guided by the 1976 Energy Conservation and Production Act which is the Federal Government's attempt to cut the nation's dependence on energy by setting limits on all new buildings. Mandated by this enactment, the Department of Energy has established what is now commonly known as BEPS, or Building Energy Performance Standards. These standards dictate an energy budget the building designer must follow, expressed in BTU's per square foot per year, for the building's total consumption. The budget, of course, is based on the building type and function in a given climatic zone. Auditing this energy consumption in new and/or existing buildings has become more important than ever before. Typically, buildings of the past were designed and constructed, primarily, on the basis of initial costs and not operating costs. This has resulted in a vast inventory of buildings which, by today's standards, utilize excessive amounts of energy. Present day standards and those of the future will utilize many of the new techniques and systems which lead to maximized energy efficiency. As a minimum, railroads are electing to replace present building inventories at the rate of from less than 1 percent to approximately 3 percent per year. As a result, the majority of existing buildings for many years to come will be those which were primarily not designed with energy conservation in mind. Henceforth, conservation of energy in existing shops, offices, and ancillary buildings has become a very real concern.

(A slide presentation followed.)

Energy Audits and Insulation

Energy Audits

Energy audits mean different things to different people. Lacking a clear definition, the term "energy audit" has in itself caused confusion. The term "energy audit" was first used in the Federal Register, June 1977, which dealt with energy audit procedures. Basically, the energy audit serves to identify all of the energy streams into a facility and to quantify energy used according to discrete functions. An energy audit may be considered as similar to the monthly closing statement of an accounting system. One series of entries consists of amounts of energy which were consumed during the month in the form of electricity, gas, fuel, oil, and steam, and the second series lists how the energy was used. How much for lighting, for air conditioning, for heating, for processing, etc.

The energy audit must be carried out accurately enough to identify and quantify the energy and cost savings that are likely to be realized through investment in an energy savings measure.

Energy Audit — Definition

The simplest definition for an energy audit is as follows: an energy audit serves the purpose of identifying anywhere a building or plant facility uses energy and identifies energy conservation opportunities.

Two Distinctions

There is a direct relationship between the cost of the audit (amount of data collected and analyzed) and the number of energy conservation opportunities to be found. These two distinctions are as follows:

First Distinction

Thus, a first distinction is made regarding cost of the audit which determines the type of audit to be performed.

Second Distinction

The second distinction is made regarding the type of facility. For example, a building audit may emphasize the building envelope, lighting, heating, and ventilation requirements. On the other hand, an audit of an industrial plant or railroad shop facility emphasizes the process and maintenance/repair requirements.

Three Types of Audits

Most energy audits fall into 3 categories or types. Walk-through, mini-audit, and maxi-audit the latter two of a more detailed type.

Walk-Through

This type of audit is the least costly and identifies preliminary energy savings. A visual inspection of the facility is made to determine maintenance and operation energy saving opportunities plus collection of information to determine the need for a more detailed analysis.

Mini-Audit

This type of audit requires tests and measurements to quantify energy uses and losses and determines the economics for changes.

Maxi-Audit

This type of audit goes one step further than the mini-audit. It contains an evaluation of how much energy is used for each function such as lighting, processing, etc. It also requires a model analysis, such as a computer simulation, to determine energy use patterns and predictions on a year-round basis, taking into account such variables as weather data.

Qualifications of Energy Auditors

The guidelines for energy auditors are found in the Federal Register. In determining qualifications of energy auditors some states are adopting the criteria set forth and adopted in the enactment of the National Energy Plan.

Audit Qualifications

Team Members

The walk through is perfomed best by a team consisting usually of an energy management engineer, architect and/or consultant, shop/plant engineer, and a management representative(s). An architect/engineer team provides an especially suitable combination of professional skills to perform the comprehensive audit analysis of the building or buildings. The first step is assembling the team and identifying the functions of individual participants. In larger, more complex buildings, someone with full mechanical and electrical engineering expertise will be needed. Where lighting and power distribution systems are of a great concern, a qualified illumination (electrical) engineer may be valuable. The representation of the building's ownership and/or management are needed, at least to ensure that various internal concerns are handled properly.

Facility Energy Users

States Follow National Energy Plan (NEA)

A 900 million dollar government funded plan is for public use and administered by each state. Energy audits are a key part of the implementation of this plan.

Survey Instrumentation

To accomplish an energy audit survey it is necessary to clarify energy uses and losses. Following are various types of instruments which can aid in the energy audit survey.

Thermovision Scanning System

Infrared energy is an invisible part of the electromagnetic spectrum. It exists naturally and can be measured by remote heat-sensing equipment.

Thermatrace

Traces thermal leakages through the building envelope.

Hughes Probeye

Also detects heat losses.

Wahl Heatspy

Views infrared heat losses. It records degree of infrared losses.

Mikron 56

Another infrared heat loss scanning device.

Ammeter

An instrument used to measure electrical current which is one of the parameters needed to calculate electrical energy.

Voltmeter

An instrument used to read the voltage or the difference in electrical potential between two points in an electrical circuit.

Kilowatt Demand Meter

A portable instrument used to read energy usage in both KWH and KW demand.

Footcandlemeter

An instrument which measures illumination in units of footcandles. They are usually pocket size and protable and meant for surveying lighting levels.

Thermometer

These are used in measuring air conditioned ventilation and hot water service applications and/or environments.

Velometer

An instrument that measures an air stream across an open space or room.

Gas Analyzer

Fryrite type is shown, which takes a measured volume of stack gas and measures volumes of gas constituent concentrations.

Carbon Monoxide Analyzer

This instrument is used for measuring traces of CO_2 boilers.

Smoke Tester Kit

An instrument used to measure combustion completeness. Smoke, as you know, is unburned carbon which wastes fuel, causes air pollution, and fouls heat-exchanger surfaces.

Air Filter Gauge

An instrument used to test pressure drop across filters.

Hydrogen Sulfide Detector

This is used to test for hydrogen sulfide during boiler inspections.

Draft Gauge

Used to measure pressure.

Sling Psychrometer

An instrument used to test air for wet and dry bulb temperatures which will identify air properties.

Combustion Gas Analyzer

Measures flue gas, CO_2 levels.

Sample Energy Audit

Railroad Office Building

We will now review an example of a railroad office facility in the midwest region of the country.

Walk Through Energy Audit — Shows Site Plan

The audit basically walks you through the steps and procedures necessary in analyzing the energy usage in a building and what can be done to reduce that use. The process involves estimating the energy which the building should use, and compares the estimate with the actual metered consumption to validate your method of estimating. If the calculated energy usage varies substantially from the metered energy usage, it may indicate that the systems in the building are either not being operated efficiently or are not being operated in the manner described to you by the owner. This sometimes can point to areas in which adjustments can be made to reduce the energy consumption. Possible building modifications are studied, and their effect on energy usage are estimated. Finally, the estimated cost of the modifications and the payout period for each are evaluated. The process begins with a walk-thru energy audit to help you become familiar with the building and to identify opportunities for improved energy use.

Building Structure

Begins the general information pertinent to the audit and continues with identifying pertinent information.

Electrical

Begins general information pertinent to the electrical audit and continues with identifying pertinent information.

Mechanical

Begins general information covering the heating, ventilating, air conditioning systems, temperature control systems, gas metering, and pumping systems and continues with identifying pertinent information.

Domestic Hot Water

Covers general and pertinent information on the domestic hot water systems.

Process Loads

Covers general and pertinent information on the process loads.

Energy Regions

A table provides the heating and cooling degree days pertinent to defining overall energy usage.

In order to accurately estimate the energy use of the building being audited and to evaluate the effect of proposed energy conserving modifications, it is necessary to have climateological data for the area in which the building is located. Starting out, it is necessary to have a data base for a minimum of one year, although a five-year data base is even better. As a suggestion, start with the previous year as your base, and add on other years.

Temperature Data

Heating temperature data is collected for each month and recorded for the hours covering daily operations.

Heat Degree Hours

Heat flow is recorded as degree hours of heating during daily operation.

Temperature Data

Temperature data is collected for each month of cooling and recorded for the hours covering daily operation.

Cooling Degree Hours

Hours of cooling are recorded for each day.

Temperature and Solar Radiation Equivalents

In computing heat gain for air conditioning loads, it is necessary to estimate the effect of the sun on the building envelope.

Monthly Temperature Extremes

In energy calculations, in order to calculate the maximum demand for either heating or cooling, it is desirable to know the temperatures on the warmest and coldest days of each month.

Monthly Temperature (5-Year Average)

Here is a compilation of information from monthly extremes from slide 59 for years 1972 through 1976. This information advises the maximum demand for any given month.

Skycover

Final information which is desirable on the climate in order to successfully estimate energy loads on the building envelope is the amount of skycover, that is, how much of the time the sun is not visible. This information can be used when calculating the effect of solar gain over a span of time and will be used in our energy calculations.

In order now to perform a more detailed energy analysis, it is necessary to collect a series of data on the building with a higher degree of detail than was used in the walk through audit.

Building Description

Form used to record data pertaining to the building envelope.

Occupancy Profile

In order to estimate the internal heat gain in the building, we need to know information about the occupants and how long they are in the building.

Lighting Data Collection

The lighting load can be a major contributor to the energy which is consumed in a building. Thus, it is important that the lighting load be accurately estimated.

Lighting Profile

Compilation of lighting data is plotted to show peak KW demand times.

Motor Data Collection

Motor loads are another energy consumer. This form plots energy demands.

Electrical Profile

A plot of the power demand of the air handling system showing peak hours.

Electrical Profile

A plot of the power demand of the exhaust fan system showing peak hours.

Electrical Profile

Another plot of the power demand of A.C. auxiliaries showing peak hours.

Domestic Hot Water Profile

Another energy consumer which should be included in your energy analysis. Here we need to know how much hot water is used per occupant per day and what the rise in water temperature is.

Analysis of Electrical Energy Usage

This form is used to record data obtained from the electric utility bills for the building under study.

In order to estimate the cost of electrical energy, usually the peak monthly demand for a given time span is required.

Maximum Monthly Electrical Demand in KW

Here the transmission loss or gain through the building envelope can be calculated for heating and cooling. Secondly, the maximum lighting load is determined, and lastly, the solar gain is computed.

Identify Retrofit and Energy-Saving Opportunities

Having first, looked at the walk-through audit, we find the following list of items to be studied:

1. Hollow metal doors could be weatherstirpped.
2. Roof insulation could be upgraded from "U" = 0.094.
3. Offices and wash and locker rooms could be equipped with timer switches.
4. Lighting level could be reduced by removing one-half of the tubes and disconnecting one ballast.
5. Study possibility of shedding load to reduce peak demand.
6. Replace existing 100 H.P. motor with a 60 H.P. motor and 20 H.P. with 15 H.P.
7. Change exterior light to high pressure sodium.
8. Add task lighting where required if lighting level is lowered.
9. Consider night set-back of temperature from 72° to 60,° particularly on weekends.
10. Consider cycling main air handler and return air fans.
11. Provide interlocking controls to prevent both water heaters coming on when electric demand is high.

Second, study the results of the detailed energy analysis and calculations. The bar graphs provide visual breakdowns of this energy usage. We can see that 45.0 percent of the energy is used for lighting. Therefore, suggestions 3, 4, 7 and 8 from the walk-through audit should be studied in detail. The electric motors use 23.9 percent of the energy. Therefore, suggestions 6 and 10 should be studied in detail. Heating uses 24.7 percent energy, with 40.5 percent of this resulting from roof losses. If the insulation were doubled, the approximate result would be a lowering of total energy use by only 5.0 percent. This may not be economically feasible. The possibility of a night set-back should be studied, since there are 92 hours per week when the temperature could be reduced. Domestic water heating uses 1.5 % of the energy. Since a timer to start and stop the recirculator pump when the building is not occupied is inexpensive to install, it should be studied.

Third, study the results of the peak demand as analyzed. We can see that on occasion both water heaters operate at the same time and affect the demand. Thus interlocking controls should be studied. Further, we see that one water heater usually

operates during morning start-up. Load shedding could eliminate at least 18 KW of load and should be analyzed.

Remember when you make modifications to one item in a building, it can affect other items. Thus, all energy using equipment must be considered when making modifications.

Calculation of Energy Usage

Here are backup calculations for supporting any retrofitting and energy saving opportunities.

Building Insulation

Inadequate insulation is the single greatest cause of energy waste in buildings. By installing adequate insulation, we can save on the order of 20 to 30 percent of the energy used to heat building spaces and about 10 percent of the energy used to cool.

Why insulate? We insulate to save money, to increase comfort and to conserve energy.

Types of Insulation

1. Blanket or Batts
2. Loose Fill
3. Blown Fill
4. Rigid Insulation

I wish to acknowledge and extend a special thanks to Jim Michel for his assistance in preparation of my committee report.

Thank you for allowing me this opportunity to serve the B and B Association.

President Budzileni: Thank you Mr. Smith and Mr. Semioli for that fine presentation.

Before adjourning, the latest attendance figures are as follows: 66 B&B; 137 Roadmasters; 129 Associates; 39 guests; and 69 ladies for a total of 440.

We will reconvene Tuesday morning at 8:30 a.m. in the Red Lacquer Room for the second joint session.

Today's session stands adjourned. Thank you.

TUESDAY MORNING
September 25, 1984

The Tuesday Morning Joint Session was called to order at 8:30 a.m.

President Meek: Ladies and gentlemen. On behalf of the Roadmasters' and Bridge and Building Associations I welcome you to the Second Joint session of this conference here in Chicago. This meeting will now come to order. This morning our registration is just a few more than yesterday: Roadmasters 189; B&B 85; Associates 196; Guests 62; for a total of 532 with 69 ladies.

At this time I would like to introduce to you the members of the Roadmasters' Executive Committee. These fellows have worked very hard this past year to make this conference possible. Actually, there is a lot more work involved than a lot of people realize, and I want to take this opportunity to thank all these fine gentlemen. As I introduce you fellows I'd like you to please stand and remain standing until I introduce everybody, and would you all please hold your applause until they have all been introduced.

Starting from my extreme left, Director M.E. McGinley, Assistant Engineer-Maintenance, Southern Pacific, Houston, Texas.

On my extreme right is Director Ken R. Welch, District Engineer, Missouri Pacific, North Little Rock, Arkansas.

Director E.J. Matte, Manager Work Equipment, CP Rail, Toronto, Canada.

Director J.T. Smith, Division Engineer, Union Pacific, Stockton, California.

Director J.D. Cossel, System Production Engineer-Track, Conrail, Philadelphia, Pennsylvania.

Director A.K. Pottorff, Assistant to Chief Engineer, AT&SF, Chicago, Illinois.

Director R.E. Snyder, Assistant Chief Engineer-Maintenance, Chicago and North Western Transportation Company, Chicago, Illinois.

Director M.J. Marlow, Supervising Engineer Tracks and Property, Elgin, Joliet and Eastern Railway, Joliet, Illinois.

Treasurer, M.B. Mitchell, Procedures and Joint Facilities Engineer, Southern, Atlanta, Georgia. Max has done a fine job for the last 4½ years as Treasurer.

Second Vice President, C.W. Moorman, Division Engineer, Southern, Greensboro, North Carolina.

First Vice President, D.E. Staplin, Director of Planning and Valuation, Seaboard System, Jacksonville, Florida.

You may now applaud.

I would now like to turn the rostrum over to President Jim Budzileni. Jim.

President Budzileni: It's always nice being second following Vince Terrill and Huburt, they take care of all the announcements. President Meek, Members of the Associations, I would like to introduce the following American Railway Bridge and Building officers at the head table. Would each of the officers please rise when your name is called and remain standing until all have been introduced. I would also appreciate it if you would withhold your applause until all have been introduced.

Starting at my extreme left is Past President O.C. Denz, Chicago, Milwaukee, St. Paul and Pacific Railroad Company, retired Supervisor of Building Maintenance, Chicago, Illinois. Omar is our immediate past president and chairman of the Nominating Committee.

Director R.A. Tallent, Process Engineer-Structures, Southern Railway, Atlanta, Georgia.

Director B.T. Burns, Steel Bridge Inspector, Atchison, Topeka and Santa Fe Railway Company, Topeka, Kansas.

Director D.R. Ladner, Assistant Engineer, Chicago and North Western Transportation Company, Boone, Iowa. Don is chairman of the Registration Committee and serves on the Membership and B&B Training Committees.

Director J.W. Davidson, Assistant Chief Engineer-Design and Structures, Burlington Northern Railroad, Overland Park, Kansas.

Director D.J. Lewis, Senior Structural Designer, Illinois Central Gulf Railroad, Chicago, Illinois. Don is chairman of the

Ladies' Activities Committee.

Director J.J. Horney, Bridge and Building System Supervisor, Union Pacific Railroad, Omaha, Nebraska. John is chairman of the B&B Materials Committee and is sponsor of Special Subject No. 1.

Junior Vice President J.T. Kapp, Projects Engineer-Construction, Design and Construction, Conrail, Philadelphia, Pennsylvania.

Junior Vice President, D.A. Bessey, Assistant Chief Engineer-Structures, Chicago, Milwaukee, St. Paul and Pacific Railroad, Chicago, Illinois.

Senior Vice President J.M. Williams, Supervisor Bridge and Buildings, Elgin, Joliet and Eastern Railway, Gary, Indiana.

You may now applaud.

And now I'll turn the rostrum back to Mr. Meek.

President Meek: It gives me great pleasure to introduce my boss, Mr. Bob Nance, and to give you a little background on Bob. He started out working for some little branch line railroad down in Arizona and New Mexico; it's called the Atchison, Topeka and Santa Fe. I suppose some of you may have heard of it. Bob started out there as a clerk and then train dispatcher.

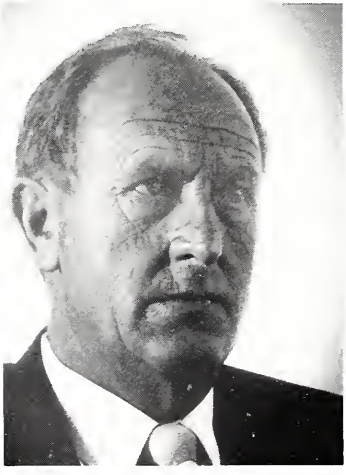
After that he went to work for the C&S in Denver as a train dispatcher. Then Bob got fouled up — he came over to the Rio Grande and went to work as a switchman for a short period of time and then went into the U.S. Navy and served for four years.

After serving in the Navy he returned to the Rio Grande and went back to work as a switchman, Bob finally went back to school, and graduated from the University of Denver. He then went to the track department and worked there as an engineering assistant and then went on to track supervisor, assistant roadmaster, assistant trainmaster, trainmaster, and assistant analyst in data processing. He was assistant superintendent and superintendent, and in 1976 he was made general manager for our railroad. During all this time he decided that four years at the University of Denver weren't enough, so he took the Advanced Transportation Management course at North Western. Since he has been general manager he was representative on the Rock Island under the ICC directed service management team. It gives me great pleasure to introduce to you Mr. A.H. "Bob" Nance.

Changes In the Railroad Industry

by A.H. Nance, General Manager

Denver & Rio Grande Western R.R.



Mr. Nance: Thank you, Huburt, and members of this Association, for the welcome and, most of all, for the invitation to address this Association. We on the Rio Grande are very proud of the fact that Huburt is serving as the president of one of the most important of all the railroad Associations. It is this group and their ability to react to the changing scene that now exists in the ever-changing American railroad industry that will, to a great extent, dictate the future of our industry. The adapatability of the maintenance of way and structures and to a degree, the railroad equipment and supplies industries have met the challenges of the last decade with a degree of success that has enabled the American railroads to again become a vibrant, growing, and, to a limited degree, a profitable

business enterprise.

As Huburt mentioned in the very generous introduction, I began my railroad career in 1946. Those of you who are my age, or older, and I notice as time goes by, there a fewer and fewer of those individuals around the railroads these days, think back with me to the railroad of the 1940's. Those of you who are a bit younger, bear with us for a moment while we re-live some of the "good-old-days."

The railroad industry that I knew was one that had just completed the task of helping our country win the "big" war. The industry engaged themselves in the war effort when the diesel locomotive was in its infancy and during those critical times had depended on the old reliable steam engine to pull the trains laden with men and equipment destined to the far parts of the world in the all-out effort to win the war. The railroads met the challenge with their belching monsters, 40 and 50-ton capacity cars, and what today seem to be antiquated signal and train operating systems.

It was an industry that had, just prior to the war years, lived through a depression of a magnitude that is today unimaginable. It was, in addition, an industry that despite the adversities of a depression and a world war, had pretty much had things its own way in the area of transportation. The interstate highway system was not even on the drawing board, the largest over-the-road truck could very laboriously haul a load of freight weighing maybe 20 tons, and air freight was something only the government could afford.

It was the industry that handled not only the transcontinental shipments of the nation's industrial centers in the east, it was the prime mover of the nation's mail and express services and most of the nation's passenger travel. It was the mover of the produce of the nation's farms and ranches. It was busily, but not very profitably, involved in the distribution of less-than-carload freight.

It was also the industry of the hot-shot, fast scheduled for any kind of traffic a customer wanted to ship. There were the melon specials, the silk specials, (our first participation in land-bridge moving Japanese silk from the West Coast to the textile mills of the East Coast), the cherry specials, the peach specials, the live-stock express, and the super-fast passenger and mail specials. It was the age of the fleet of the "City of Trains," the Zephyrs, Rockets, Eagles, Limiteds, Hiawathas, and Empire Builders, the El Capitan and the Super Chiefs, and all of the other streamliners speeding back and forth, north, south, east and west, filled with passengers and mail.

Those years, like the ones that had preceded them, from the first days of the iron horse were truly the "good-old-days," weren't they? Those of us who were employed on the rails in the "good-old-days" were convinced we were doing one helluva job. We were members of one of the most important and powerful industries in the nation and everyone needed us. The only way we could do a better job was to hire more men, and buy more material, and have a little less interference by government, and lots of patience from our customers who had learned to live with service that met the railroads convenience, not the needs of the customer.

It was an industry that had ample cash flows and, if it was fortunate enough to have good management, had the wherewithall to maintain its facilities and rolling stock to the highest standards. The maintenance of way and structures missions were accomplished through sections stationed every 10 to 15 miles, steel gangs of 200 or more men, surfacing gangs of 200-300 men scarifying the tracks with picks and shovels and replacing the ballast with track jacks, spot board, tamping bars, and track shovels. Why, some gangs were even mechanized, using air compressors, air hammers, and tamping bits.

The trains moved rapidly over the tracks, but not too far between stops. We had to stop for coal — we stopped for water — we had to stop for train orders — we stopped for train meets and passes as directed by train orders — we had to stop for hot boxes and for a thousand other reasons, but we still did a helluva job.

The only problem with the great job we were doing was that everybody didn't agree with us. During the late 1940's and early 1950's some things began to happen that changed this industry. Highways were im-

proved, pipe lines continued to grow, trucks became more powerful and their trailers grew in size, rivers were dredged and opened to extended use by barges, the Saint Lawrence Seaway was being built, and air lines operating out of air terminals financed by tax dollars began to become a factor in the transportation of people and air mail.

A transition was beginning to take place — but not to worry — we had our own weapons. We had the diesel which was steadily reducing our operating costs, and the traffic that we were losing to the trucks and air lines really didn't matter. Everybody knew there was no money to be made handling passengers. Less than car load traffic had always been a loser and was a pain in the neck to handle. The U.S. Mail was important, but what the heck, if the air lines wanted to handle a little bit of air mail, what did that matter. The truckers were doing us a big favor by handling that pesky live stock, and if they wanted to go through the grief of handling perishables with all that icing, salting and high freight claims, why, let them have it.

These ideas were deeply ingrained in all of us. With the coming of the 1950's the industry realized it truly had a problem. The truckers were not content to handle just the traffic we didn't think we cared about. They were making in-roads into what had been considered to be the railroads' traffic, traffic that no other transportation mode could handle.

Not only had they attempted to move the production of the auto plants, those upstarts had actually pulled it off — auto traffic was non-existent on most railroads. They were beginning to move more and more of "our" traffic. Products of "our" steel mills, canned goods, pipe and manufactured goods of all kinds were now moving on trucks, not locally, but transcontinentally over the constantly improving publicly financed federal highway system.

Air lines were no longer content to move just people; they were rapidly overtaking the railroads in the volume of mail being handled.

Pipe lines that had previously handled only natural gas were now moving crude oil from the oil fields to the refineries and were, in addition, beginning to move the finished products from the refinery to the local distribution points. Worse than that, the piplines had the audacity to suggest they could, by using a slurry method, transport commodities like coal, grain, and other bulk commodities.

Other things that would affect the railroads' future were beginning to come into focus. The far east and European industrial giants were recovering from the devastation of World War II and began to produce more than they consumed in their local and regional markets. They had new modern plants, new technologies, and cheap labor. America, with its high labor costs and antiquated industrial plants, was a perfect market target for those excess goods.

During the 1960's and 1970's, as the foreign industries' capacities expanded even further and our relative costs, fueled by inflation, went higher, the effects became devastating on our nation's heavy industry. They are no longer the users of the vast quantities of raw materials that are so well suited to rail transportation.

During these years the railroads, too late in some cases, recognized that changes had to be made. Efforts were made to recapture significant segments of the business we had lost. To offset the lower costs of foreign competition the unit train concept was implemented to lower the costs of some of the raw materials and farm products moving to steel mills and ports. Special car equipment of all kinds were designed, purchased, and used in an effort to recapture some of the traffic that had been diverted to highways and other modes of transportation. There was a greater emphasis on designing train schedules and services that would meet the customers needs, not the operating convenience of the various carriers.

The railroads were responding in other ways. The conversion to diesels was accomplished, and the era of the steam engine was gone. The 100-ton car made its appearance along with the 89-foot flat car. The 1,500-horsepower, DC generator equipped diesels were being replaced by a new generation of high-horsepower alternator-equipped locomotives capable of handling even larger trains more efficiently. The

train air brake system was now being supplemented by the effective extended-range dynamic braking systems of these new powerful engines. Some strides were taken by both labor and management in the elimination of many of the non-productive work rules that had in the past driven up the cost of operations and were adversly impacting the carriers to the point where they were becoming more and more vulnerable to the competitive pressures of the trucks, pipe lines, air line, and water carriers.

A measure of the effectiveness of the industry's efforts to trim back its labor force and lower its costs to become more competitive is reflected in some statistics that were available to me on the Rio Grande. The force report for January 1946, compared to January 1984 is amazing. In 1946 there were 3,872 employees in the Rio Grande's mechanical department. In 1984, 568. Transportation employees numbered 3,200 in 1946 and by 1984 had been reduced to 1,206. In 1946 there were 1,540 maintenance of way structures employees as compared to 653 at the beginning of this year. General office employees decreased from 1,574 to 466. Total employment for our system in January, 1946 was 10,135. In 1984 that number had dwindled to 3,044, 828 fewer employees over the entire system than there were mechanical department employees in 1946.

As these few statistics indicate, the Rio Grande, along with the other carriers that had a dedicated and forward looking management and lucky enough to have had the financial strength to survive, did manage to survive; those carriers without one or both of these survival ingredients have faded into oblivion.

The survivors continued to improve their operations and their traffic base. Using the latest technologies available in motive power, cars, computers, radios, microwave, and advanced maintenance of way equipment and methods, some of the lost traffic has been recovered and most carriers are improving their return on investment. The industry as we know it today is a far-cry from the industry I knew when I hired out 38 years ago. As I look about on our property, read the financials of other carriers, and read the trade magazines, I again have the urge, as I am sure most of you do, to proclaim again, "we are doing one helluva job." But are we?...Let's look at the present and the future in the light of the events of the past.

It is my belief that the railroads of today are again, as they were in 1946, at a very critical point. We have regained some of the traffic that had been lost to other modes, but the sobering fact is in 1983 our railroads handled less than 36% of the nations intercity freight tonnage — in 1946 they handled about 75%.

The railroads today are moving vast quantities of coal, most of it to power plants for the generation of electricity. Look at the financials of the individual railroads — those with a strong base of coal traffic are healthy — those that don't have it are struggling. The fact is, this traffic can also be lost for many reasons. Environmentally the claims of acid rain and associated problems allegedly caused by the emmission of coal-fired plants could, if proven, destroy this revenue source. Nuclear power, despite the negatives we hear today, will be developed, and in the future will compete with coal as the generator of our electricity. The slurry pipe lines could also be a factor in the movement of this important commodity.

Railroads have, through some innovative services and special equipment, recaptured the auto traffic, but, as we all know, a change in distribution or manufacturing schemes by the auto makers can reduce this traffic to a trickle.

We are all aware of the conditions that exist in our steel industry. The importation of foreign steel has spurred our domestic producers to alter their methods of production and patterns of distribution. With the use of the electric furnace they no longer consume vast quanitities of coal and iron ore — merely a few cars of scrap. The minimill concept provides for a production level that satisfies the demand within a relatively small local or regional market. No longer do we enjoy the large movement of finished steel products moving coast to coast.

TOFC, or intermodal traffic is growing by leaps and bounds, but it too has some drawbacks, because today, it is classified as *marginally profitable.* This causes one again to reflect upon the past. Remembering that there was a time that our industry

really didn't care if we handled live-stock, perishables, passengers, or LCL, because it was troublesome and only *marginally profitable*. We again stand in those same shoes, but this time we, and especially the members of this Association, must find ways to reduce our costs to the point where intermodal traffic becomes more than *"marginally profitable."*

In past years, many distinguished and respected railroaders have addressed this Association; John Reed, Larry Cena, Robert Krebs, and Dick Spence to name a few. Each of them has recognized the significance of your jobs and responsibilities as one of the keys to the continued success of our industry as independent participants in a free, private enterprise economy. Each of them has asked for your help in one way or another.

In 1974, Mr. Reed was concerned about the effects of governmental regulation and the burdens it places on our industry. The Staggers Act reduced some of the ICC's regulatory powers over freight rates, but regulations from other agencies has only increased. Let me ask you, what have *you* done to decrease or at least control your costs in complying with these sometimes burdensome rules and more importantly, what have *you* done to show the public and the government that such regulations are unnecessary?

Mr. Reed was also concerned about our industry's image, as the public perceives it. He asked for your help in improving this image in each of the communities where we work and live. Again, what have *you* done about it?

In 1979, Dick Spence expressed concerns about bringing more young people into our industry and training them to be the leaders of tomorrow — what have *you* done about this important matter — have *you* encouraged any to come aboard — have *you* discovered any diamonds-in-the-rough working in your gangs and encouraged him or her to learn and progress and most importantly, what have *you* done to train and develop them.

He was also concerned about "keeping the problems in front of superiors;" in other words, how well do you communicate your real problems to those above you? Are you really telling it like it is, or are you saying what you think the boss wants to hear?

One of Dick's big concerns was your determining the level of maintenance required to meet the service demands of a particular territory. How well have *you* done this, and how have *you* applied it to your area of responsibility?

In 1981, Mr. Cena stressed the importance of doing a little "dreaming" to develop solutions to our maintenance problems. He suggested that the solution to our problems would not necessarily be discovered in the research lab, but in the minds of the people who are involved with the every day tasks that involve those problems. Have *you* dared to dream a little? What have *you* done to bring these ideas forward and to push for their implementation.

Mr. Cena challenged all of us — railroaders and suppliers alike — to solve the problem of track occupancy while we do our maintenance and rehabilitation work. That was three years ago. I am not aware of the existence of any equipment innovation that even begins to solve this problem. Again, what have *you* done about it?

He also challenged *you* to come up with new and better materials to withstand the stress of the increased wheel loads. The need is still there — have *you* really searched for them — looked at the new space age metals and composite materials, or have you just shrugged it off with the idea that what we have "ain't too bad," and the railroads have always been satisfied with it in the past?

Mr. Krebs, last year, expressed his optimism about deregulation and the impacts of mergers as they effect our industry. He, throughout his address, discussed the needs for cost controls and quality work. He related to you the signficance of reducing costs in making deregulation a success. A railroad's ability to control its costs will determine the rates that will have to be charged the customer. It is clear, those with the lower costs will have the lower rates. Those with the lower rates will capture most of the traffic. Each of *you* here today will have a direct bearing on how well your individual railroads will perform in the acquisition of traffic. All of *you* collectively will determine the future of our industry.

In looking at our past, our present, and our future, I think we have cause to ask

"are we really doing one helluva job"?

Thank you again for the opportunity to have shared some of my views and concerns with you.

President Meek: Thank you very much, Bob. You know every once in a while we become very complacent. It's nice to look into the past sometimes. For example, the first Roadmasters' Conference I attended was an equipment show here in Chicago, and all the equipment was in the basement of the Stevens Hotel in 1946. The biggest piece of machinery there was a Jackson Tamper. So we've come a long way, but we had a long way to go. We've got to really look into the future, all of us, the suppliers and ourselves, and do something to help our management get the costs down where we can not only maintain the business that we have now, but pick up more business. It's easy to blame the boss, but it's not always the boss's blame. We're the guys who are out there supposed to be letting him know what we've got to do.

I would like now to call on Don Bessey to introduce our next feature.

Mr. Bessey: Our next special feature is Elko, Nevada, Line Relocation and will be presented this morning by James A. Carney. Mr. Carney has been employed with the Federal Highway Administration and its predecessor the U.S. Bureau of Public Roads since 1959. He has served in various highway engineering capacities in the states of Oklahoma, Texas, Arkansas, Florida and Kentucky. He has been Chief of Railroads and Utilities Branch, Office of Engineering since 1975 and presently serves as Chief of the Railroads, Utilities and Programs Branch. In this capacity he has broad administrative responsibilities dealing not only with railroad-highway matters, but also with programming and eligibility issues involved with the $12 billion a year federal aid highway program.

Mr. Carney is a native of Oklahoma and received a Bachelor of Science Degree in Civil Engineering from the University of Oklahoma in 1959. He has also been awarded a Masters Degree in Public Administration from American University in Washington, D.C. Mr. Carney.

Elko, Nevada, Line Relocation

by James A. Carney

Chief, Railroads, Utilities, and Programs Branch
Federal Highway Administration

Many cities in recent years have been concerned about railroad-highway conflicts within their urban boundaries. These conflicts include not only safety concerns, delays, and increased operating costs associated with at grade crossings but also hazards to community safety, barriers to community cohesiveness created by railroad facilities, environmental degradation from operations, incompatible land use patterns created, and reduced railroad efficiency. The relative importance of these elements of conflict vary between railroad service, traffic densities, local economy, and community attitudes toward their environment and toward the railroads.

Relocation or consolidation of railroad facilities are potential remedies for many of these conflicts. Additionally, grade separation structures, closing of crossing, and encouragement of compatable community land development practice can serve to reduce certain conflicts. Some cities have prepared rail relocation plans to help alleviate these railroad-highway conflicts, yet few of the plans have been implemented due to lack of funds.

In response to increased community interest to develop solutions to their railroad-highway conflicts, the Congress took legislative action. Section 163 of the Fedeal-Aid Highway Act of 1973 authorized demonstration projects in 12 cities for the relocation of railroad lines from the central areas of the cities and/or the elimination of railroad-highway conflicts. The 12 cities are Elko, Nevada; Lincoln, Nebraska; Wheeling, West Virginia; Blue Island, Carbon-

dale, Dolton, East St. Louis, and Springfield, Illinois; New Albany, Indiana; Anoka, Minnesota; and Brownsville and Greenville, Texas. Section 163 later was amended and 7 additional cities were added to the demonstration program. These 7 cities are Hammond, Lafayette and Terre Haute, Indiana; Pine Bluff, Arkansas; Augusta, Georgia; Metairie, Louisiana; and Sherman, Texas, although Sherman later withdrew from the program leaving a total of 18 cities.

Many of these demonstration projects were originally considering proposals which involved extensive relocations or consolidations of railroad facilities. These proposals proved to be quite expensive and for most implementation has not been possible as only a limited amount of demonstration funding has been available. As a consequence, several projects have been redirecting their efforts towards implementation of lower-cost solutions, such as construction of grade separation structures at key existing railroad-highway crossing.

To date, construction of two low-cost projects, New Albany (minor track relocation) and Anoka (grade separation), has been completed. Further, demonstration funds will be used to complete low-cost projects in Greenville (minor rail consolidation and grade separation) and Terre Haute (grade separation). Demonstration funds are also being used to complete the Elko project which involves extensive relocation of rail facilities. This project will be discussed in further detail at a later point. For the remaining 13 projects, demonstration funding has provided for preliminary engineering to develop conceptual plans, and several projects are proceeding with final design efforts. Demonstration funds are not presently available to implement the overall solutions on these 13 projects; however, demonstration funds are being utilized to construct lower-cost usable segments (i.e., independent grade separations, etc.) on 7 of these projects.

Another significant feature of Section 163 of the 1973 act was that it required the Secretary of Transportation to undertake an investigation and study of the problem of providing increased highway safety by the relocation of railroad lines from the central area of cities on a nationwide basis, including an estimate of the cost of such a program. Although the legislation refers specifically to providing increased highway safety by relocation of railroad lines, general accord was reached that the scope of the study should be broader. Consequently, the study was to consider all highway benefits, railroad benefits, and community benefits resulting from the consolidation and relocation of railroads in urban areas.

The study was conducted by the Federal Highway Administration (FHWA) with support from the Federal Railroad Administration and in cooperation with State highway agencies and local officials. Study efforts were also coordinated with the Joint Committee of the American Association of State Highway and Transportation Officials and the Association of American Railroads.

The report on the study effort is entitled *Railroad Consolidation and Relocation in Urban Areas* and was printed by Congress May 24, 1976. The report concludes that there is increasing nationwide interest in urban railroad consolidation and relocation as a means of alleviating conflicts between railroads and other urban area activities. The consolidation alternative in improving urban railroad facilities is stressed. The report estimates that approximately 1,600 urban places were experiencing some evidence of possible railroad conflicts. Based on the report's economic analysis, it was estimated that urban railroad consolidation and relocation projects nationwide, costing nearly $2 billion in 1975, could be warranted by quantifiable benefits alone. Experience now indicates that this figure is unrealistically low. One percent of this cost was including all highway user benefits. An additional 25 percent was justified by including estimated railroad benefits and the remainder by including quantifiable community benefits.

The report recommends that urban railroad consolidation and relocation projects should be identified through a comprehensive urban area planning process, considered within the context of the total urban area transportation needs, and be given consideration with other transporta-

tion improvements for the area. I further recommend that since urban railroad consolidation and relocation projects are primarily justified by community social benefits, Federal-aid funding for these projects should normally be made available from existing or currently proposed community improvement programs and funding sources in accordance with priorities determined by State and local agencies for use of these funds. Federal-aid funds for transportation improvements should be available to participate at a level commensurate with transportation benefits. Several recommendations are made regarding needed railroad planning and required Federal funding assistance for railroad network planning, including integration of the railroad mode into area planning.

And now let us more closely examine the Elko demonstration project, nicknamed "Project Lifesaver" by the local community. Elko is located in northeastern Nevada and had a population of 8,700 in 1980. Elko was founded by the Central Pacific Railroad (later to become the Southern Pacific Railroad) in 1869 as it was building its way to meet the Union Pacific Railroad at Promontory, Utah. The community grew and prospered in the early days due to the commercial enhancement of the railroad, with business and residential development centering on the railroad. The railroads in turn depended on cities like Elko to provide food and housing for their patrons. In recent years, however, the railroads and community became less directly dependent on one another, and the location of the railroad tracks and numerous grade crossings were a detriment to both.

In 1973 when the demonstration program was initiated, two railroads, the Southern Pacific and the Western Pacific (now Union Pacific), operated a combined total of approximately 40 trains daily on parallel tracks one block apart through the heart of Elko. There were numerous grade crossings of city streets by the railroad tracks, presenting a safety hazard both to motorists and pedestrians as well as a detriment to traffic mobility. The downtown business district was suffering and deteriorating because of the direct adverse influence of the proximity of the railroads. Delays to emergency vehicles for police, fire, and ambulance services were common. Further, trains were operating at relatively low speeds through Elko because they were either entering or leaving a yard and because of a city ordinance.

To respond to these conflicts, the project began investigating alternative solutions. A primary feature immediately evident was that it would be highly desirable to have the two railroads' operations consolidated into a single corridor. The next phase was to determine the location for this corridor. Several alternative alignments were investigated. Two alignments involved lengthy relocations of tracks, one bypassing Elko near the northern boundary of the urban area and the other bypass alignment outside the southern limits of Elko. Additionally, the possibility of either a depressed or elevated alignment through the downtown area was studied. A final corridor reviewed was located through the southern portion of Elko along the Humboldt River and was less lengthy than the two bypass alternatives. In 1975 the latter corridor along the Humboldt River was selected as the recommended corridor for the railroad relocation and consolidation.

Design work then began immediately. The plan to be implemented along the Humboldt River alignment consists of approximately 2.8 miles of two main line track placed within a common corridor for both railroads. Corridor width varies from 70 to 200 feet. Further, the corridor has substantially full control of access through use of fencing and mansonary noise abatement walls. The Western Pacific yard facilities located near the downtown area are being relocated to about three miles east of Elko. Two vehicular grade separations, one pedestrian overpass, and one new vehicular river bridge are being provided. The project also includes channelization of the Humboldt River to reduce flooding problems, relocation of a small city park, and construction of a new unmanned Amtrak station. Of significant importance is that the project will result in the elimination of 20 grade crossings.

The two new main line track consist of 136 pounds continuous welded rail. The

Western Pacific track used conventional timber ties. However, the Southern Pacific used concrete ties as the railroad felt this provided a good opportunity to test the durability and performance of concrete ties in a comparison environment with the timber ties. Southern Pacific agreed to pay the extra cost for the concrete ties which is reported to amount to about $19 per track foot. In relocating the Western Pacific yard, demonstration funds are being used to restore those functions being provided in the existing yard. For the new yard, demonstration funds will provide for the same track capacity as the present yard, although it has been arranged in such a fashion as to accommodate the current operation of the railroad and future expansion plans. Existing yard facilities, such as a locomotive and car repair shop, an office building for division and yard personnel, a shop and storage building, fueling facilities, and other miscellaneous facilities, have been replaced at the new yard.

The first construction contracts were awarded in 1978. Over the next five years several additional construction contracts were initiated as the project was implemented by various stages. By late 1983 the majority of the construction work was completed and rail traffic was shifted to the new consolidated corridor. Presently, the last remaining contracts, which involve track removal work and adjustments to city streets in the downtown area, are being completed.

The majority of the construction work, including grading and drainage work for the new railroad corridor and yard, the accompanying grade separation, and many of the facilities at the new yard, were completed by contractors under competitive bid contracts. Placement of a good portion of the new ballast, ties, rail, and switches, and restoration of the railroad communication systems were completed by railroad forces. The cost of this railroad force account work amounted to about $4 million of the overall project costs.

In 1976, when the relocation plan was being developed, project implementation costs intitially were estimated to be about $18 million. However, as detailed plans were developed and as inflationary increases in construction costs occurred, it became evident considerably more resources would be needed to complete the project. The FHWA will provide $42.53 million in demonstration funds to the project, these funds being used to cover 95 percent of the costs. The total amount of demonstration funds available through the fiscal year 1984 to all 19 designated demonstration cities is $141.6 million. Nearly 30 percent of the total, has been provided to Elko.

The demonstration project in Elko, along with the other projects in the demonstration program, have been advanced by the FHWA generally following the procedures utilized on regular Federal-aid highway projects. Specific responsibility for administering the Elko project has rested with the city of Elko with the assistance of the Nevada Department of Highways.

A key factor to the project's successful conclusion has been the cooperation of the two railroads whose facilities were to be relocated. Early on, written agreements were secured between the public agencies and the railroads delineating the plan to be implemented and the responsibilities of the various parties. A signficant feature of the agreements was that the railroads agreed to a cost sharing arrangement whereby both railroads contributed towards the 5 percent non-Federal share of the project. These combined contributions from the railroads have amounted to 3.37 percent of project costs.

Reaching a successful conclusion to the Elko project has proven to be no easy task. It has required the diligent efforts of all the involved parties. Several of the design elements of Elko project have required adjustment to railroad facilities which we in the highway community normally do not confront. As consequence, cooperative working relationships between public entities and the railroads were critical and essential. The project simply could not have been practicably done without this cooperation.

Completion of the Elko project plus our experience with the trials and tribulations of the other demonstration cities does present an opportunity to reflect upon the railroad relocation projects. Based on the program progress to date, we have drawn the follow-

ing conclusions:

- The overall progress in developing a specific railroad-highway demonstration project is comparable to a major highway project in an urban area. As with major highway improvements, a railroad relocation project can have substantial impacts on an urban area, and effective community participation is essential if there is to be orderly development without delays.
- For project proposals impacting multiple railroads, cooperation of the involved railroads is essential if the project is to be successfully advanced.
- For the larger projects involving significant railroad relocations, initial cost estimates tend to be too low. For instance, for several of these project, present cost estimates are nearly triple the original estimates. Although some cost increases can be attributed to inflation, it appears that as the conceptual plans are more fully developed the magnitude of the project costs quickly increases.
- Completion of the solutions originally being developed for the 19 cities in this demonstration program alone were estimated to required over $1 billion. If this provides some measure of the level of resources needed to complete typical projects, on a nationwide basis an enormously large amount of funds would be necessary if the needs of all the cities with potential railroad/highway/urban conflicts are to be addressed in this manner.
- Designation of projects by Federal legislation plus high cost projects such as these focus our limited transportation resources on a narrow range of activities. The FHWA does not favor this approach but instead supports a process, such as our regular Federal-aid program, which allows states to select and initiate transportation projects on a priority basis.
- It is evident there continues to be considerable interest nationwide in urban railroad relocation.
- It is also evident that it is unlikely that an abundant supply of financial resources will be available to implement the larger, more costly rail relocation proposals. As a consequence, cities seeking to advance proposals should be developing solutions commensurate in size to funding sources which can reasonably be expected to be available.

Railroad-highway and railroad/urban conflicts will likely continue to increase in magnitude. Communities will be seeking the ways and means to alleviate these conflicts. The challenge lies in finding effective methods to address the problem which will reflect the inevitable financial constraints present. In this respect, I can only conclude that long term solutions will only come about when social and economic forces join together and demand them. These solutions will not be brought on by Government mandate but rather by the recognition of the parties concerned that changes are needed, and the time has come to make them. A way will be found, when both the public and private sector agree that it is in their best interest to proceed.

President Meek: Thank you, Mr. Carney. I would now like to turn the rostrum over to Mr. Budzileni.

President Budzileni: That concludes this portion of the Joint Session. The B&B Session will reconvene in the Adams Room on the sixth floor at 10:05 a.m. And the Roadmasters will meet back here in the Red Lacquer Room at 10:05.

I declare this Session closed.

...Recess...

TUESDAY MORNING

September 25, 1984

President Budzileni: Please be seated, and will someone please close the doors. Thank you.

The second session of our 89th conference is now in session. Ladies, members, and guests, all officers at this table have previously been introduced. The two guest speakers will be introduced at a later time.

At this time Mr. Bessey, Chairman of Special Features, will introduce one of the guests. Mr. Bessey.

Mr. Bessey: We've talked about track, we've talked about bridges, new we're going to talk about buildings. The subject of the first special feature this morning is The Use of Steel Studs in Buildings. It's a subject for which we searched around to find someone to present to us, because we knew it was a subject that we wanted to get out to our people. We want our people to learn about these products and use them, because they are being used in the construction industry today, and we want to make everyone aware of what these products are; when you go back to your respective responsibilities, take a good look at these products. To make this presentation is Mr. Peter Jahn who is product manager of light gage steel framing products, Chicago Metallic Corporation.

Mr. Jahn is a graduate of Michigan State University with a B.S. in Mechanical Engineering, and he obtained his M.B.A. from Illinois Institute of Technology in 1980. Mr. Jahn started with Chicago Metallic in 1980 as Product Manager to develop their light gage steel product framing line. Mr. Jahn.

Use of Steel Studs in Buildings

Peter G. Jahn,

Chicago Metallic Corporation

(Whereupon there was a slide presentation with the accompanying remarks.)

In addition to death and taxes, there's an ever-increasing list of things you can count on these days.

Inflation, for one. Higher labor costs for another. And we've come to expect questionable quality with certain building materials.

Designers of industrial and commercial buildings can also count on uncommon price fluctuations for these materials. And construction costs and labor skills are, at best, uncertain.

So, to defend yourself against what otherwise would be inevitable, it makes sense to specify light gage steel framing, you've got all the benefits going your way. This presentation will show you why. Light gage steel framing is the definitive framing system for commercial, industrial, and residential construction.

Light gage steel framing is made from cold-rolled steel sheet which can be either hot-dipped galvanized or red oxide painted.

The steel is roll-formed into C-shaped sections that become load-bearing studs, floor, ceiling and roof joists, runner tracks, lintels and other framing members.

It should be noted that light gage steel framing is not the same product as drywall studs; lighter gage metal studs which are used mainly for non-load bearing partition framing. This type of framing is commonly referred to as 25 gage stud and track.

Nor is C-framing comparable to heavier hot-rolled structural steel.

Light gage steel framing is a unique building material that can be used to special advantage in load bearing stud walls, both exterior and interior, wind bearing curtainwalls, floor framing joists, ceiling joists and roof joists, and for specialized applications like this exterior stairway enclosure.

Or in conjunction with other building components, such as bar joists or structural steel.

C-framing has been around for years -and has been thoroughly tested and proven in all types of construction and applications. However, designers can make even more efficient use of this product when they become aware of its many benefits. Particularly in the design and cost-saving benefits of an all-steel framed building. For years, contractors have used C-framing. They've enjoyed its benefits like fast and easy installation, no waste or rejected material, and lower in-place cost. They've discovered its special advantages over wood, concrete and masonry construction. But light gage steel framing offers some very important benefits to architects and designers as well.

Benefits like versatility. Light gage steel framing can be used with various types of wall covering and sheathing, floor decks, and roofs.

C-framing is available in various sizes (2½ inches thru 12 inches) and gages ranging from 12 thru 20. Greater strength and less weight allows the architect to design a frame that's both material and cost-efficient. Life cycle costs are particularly favorable.

C-framing is dimensionally stable. The quality of steel is controlled in the manufacturing process, so you're assured of a durable, uniform product.

C-framing is compatible with other traditional building materials. Installation techniques are also traditional. No new skills or special materials are needed.

Manufacturers of light gage steel framing have secured code authority approvals, so architects save time. The product is also fire-rated.

Most manufacturers are prepared to help architects design with light gage steel framing. Their people and technical material can provide the architect with a real economic advantage, plus confidence in, and total understanding of the product. Detailed drawings for specific jobs are also available from manufacturers.

C-framing is used in a wide range of construction applications, but we will concentrate on the types that are generating the most design interest today - light commercial and industrial building; particularly for back-up or brick veneer in curtain wall assemblies.

C-framing represents an efficient use of material. It offers lighter weight and less cost, plus labor savings. Let's look at how this innovative building material goes together.

C-framing is delivered to the construction site neatly bundled and pre-cut to exact specified lengths. Each piece is clearly marked to help assure an accurate, waste free installation.

Installation is clean and fast. Pound for pound, steel is stronger than other types of framing, so spacing between framing members can be increased. This means a more efficient use of material by the designer and less handling for the contractor's crew.

A lighter frame can also mean significant reductions in the foundation and other structural elements. All of this can save money for the owner.

Joist and stud length is limited only by transportation regulations. Joist lengths up to 40 feet are practical and can result in additional design efficiencies.

A full line of accessories - such as reinforcing members - is readily available. Here, a cap has been force-fitted into a joist in order to transmit vertical loads from upper floors to the foundation.

Here, a hanger has been used to attach C-framing to a stairwell joist. Accessories

improve the efficiency and flexibility of a C-framed structure. Manufacturers can recommend when and how accessories should be applied.

The deck can be attached with self-drilling screws, or with hardened screw-shank nails and construction adhesives.

A corrugated steel deck can be fastened to the joist with screws. After concrete is poured, this type of assembly provides a sound, lightweight floor.

Steel framing members can also be welded together. All welds should be protected using zinc-rich paint.

Incidentally, no special tools, handling, equipment, or skills are needed to assemble a C-frame building.

Steel framing for walls also assembles easily. The pre-cut pieces may be screwed or welded together on a jig table - either on or off-site.

The lightweight wall frame is then raised into position, and attached to adjacent framing. There are various methods for attaching the wall frame to the deck or foundation, manufacturers can provide the architect with details and suggested specifications.

Because each wall framing member is precisely cut and fit, windows and doors install easily and operate properly.

Another big plus for framing with steel is that it's a cavity wall system. That allows the easy application of insulation more efficiently than is possible with other types of structural framing.

Joists and studs are uniform, so floors are flatter, and walls and ceilings are less likely to separate and show nail pops. Steel cannot warp, shrink, or rot, and is impervious to insect and rodent attack.

To facilitate plumbing and wiring installation, manufacturers can pre-punch holes wherever specified.

Ceilings can be attached directly to the joists, or to resilient channels.

Here, drywall is being applied. Various types of wall coverings can be attached to studs directly with screws, or with furring. Nail pops are eliminated by using self-drilling and tapping screws, thereby avoiding expensive call-backs.

The same is true for exterior sheating and facades.

C-framing can also be panelized.

A light gage steel framed building goes up fast, regardless of weather.

Curtainwall assemblies install faster and can weigh half as much as other types of exterior treatments.

Various types and sizes of light gage steel framing are made by manufacturers. There are differences in these products that you should be aware of.

Super-C steel framing was developed by U.S. Steel, and is sold by independent licensees, of which we are one.

All products developed by U.S. Steel are subjected to extensive laboratory testing before being placed on the market. Super-C was no exception. After years of testing and development in both the lab and field, Super-C was submitted for code approvals.

All four of the major code authorities have approved Super-C joists and studs. The testing has continued to date. Job histories have been compiled to demonstrate how the system performs... how it responds to dead and live loads, to wind and seismic loads.

And life cycle cost analyses - including installation time and money savings - have been performed.

Tests by the NAHB Research Foundation prove that the sound transmission characteristics of steel stud framed assemblies are equal to, or better than, other materials.

Studs, joists, and tracks are roll-formed from either galvanized or painted sheet steel and are available in combinations of gages and depth sizes. By specifying various depths and gages, architects can achieve the most efficient use of framing materials.

Because C-framing is available in lengths

up to 40 feet, walls can be framed two or three stories at a time, and floors and roofs can be framed in either direction, further enhancing design flexibility.

Further design options include various span constructions. To make designer's job easier, load-span tables are available for all of these options as are suggested specifications and design steps and considerations.

You can depend on most manufacturers for on-the-spot expert design and technical assistance. He'll help you make sure that structural integrity precisely matches design intention.

Your local manufacturer can also show you why light gage steel framing is the definitive framing system; how it's the one that offers excellent strength to weight ratios and other features that allow the most efficient applications. This means weight and money savings.

Rigid controls assure a quality product, from the rolling of the steel to delivery at the jobsite.

No other building material offers steel's durability. Steel framing is impervious to rodents and pests and resists corrosion.

C-framing provides unequalled flexibility of design. It's compatible with other traditional materials and techniques.

Every piece of C-framing is pre-cut and marked so there's less chance for isntallation errors. There's no waste.

Steel framing is approved by the four major code authorities and exceeds all requirements.

Steel is non-combustible, so it won't burn or generate smoke. C-framing components have one and two-hour fire ratings. Their use could reduce fire insurance costs.

Stud framed cavity wall facilitates the application of insulation. And tests prove that it has excellent resistance to sound transmission.

Nationwide, thousands of structures have been built using light gage steel framing, so there's a wealth of design and construction experience to draw on.

For all of these reasons - and more - proper application of light gage steel framing can result in lower life cycle costs when compared with other types of framing.

So, for time and cost-effective solutions for light commercial, industrial, and residential framing, consider light gage steel framing.

It's the totally practical framing system that gives free rein to your design challenges.

That concludes the slide presentation portion of this program. Do you have any questions on this presention?

Mr. Bessey: Railroad carpenter crews, formen, and supervisors who have been used to using wood studs for generations, where do they learn the special technique necessary to use these products?

Mr. Jahn: Well, steel framing is quite similar to wood framing except that instead of a single stud with steel framing you have tracks and studs. The tracks are laid on the floor and the ceiling and the studs are fitted between. Studs can then be screwed to the tracks. Spacing and a lot of the connection details are similar to wood framing except that screws instead of nails are used.

Member: What is the relative cost between using a steel stud and a conventional wood stud?

Mr. Jahn: Okay, I'd like to divide that into two categories. As one of the slides mentioned there's one for drywall framing systems, which are 20 and 25 gage portion studs and the other division would be light gage steel framing which I have gone over on this presentation. In the 25 and 20 gage portion studs there is a definite advantage over wood studs as far as cost is concerned. One of the main advantages is that for wood studs you pay a premium for lengths over eight feet. You know when you get into 10 and 12-foot lengths you pay quite a bit more per foot. With steel framing you do not pay a premium for those lengths. Every piece is straight and true. So there is a definite advantage there. When you get into the light gage steel framing or the load bearing stud track as compared to wood studs it is slightly more expensive than wood framing. But a lot of the reasons we've seen that metal is used is the fact that wood framing

would not be appropriate for the construction. Basically you need a fire rating, and with wood you cannot achieve it. And also, steel framing members can sometimes do things that wood framing cannot do in the fact that there are longer spans that you can achieve. That's basically it.

Member: You talked about insulation in the cavity wall. Don't you get quite a bit of heat or cold transmission through the studs themselves?

Mr. Jahn: That has been a problem. If you just apply sheeting materials to the exterior and the interior and put insulation in the cavity, in some cases you'll get what is considered shadowing. And that is an effect when the stud portion of the wall is colder; therefore, it collects moisture and then dirt, and you can see the shadow on the inside stud wall. One way of avoiding this is to go to a deeper cavity like a six inch stud and increase the amount of insulation. The other method that we see more commonly being used is that insulation is applied to the exterior of the stud flange. There are a lot of systems out there that are exterior insulation systems, where they apply the insulation over gyp sheeting then a lightweight plaster aggregate. The other method would be if you want just to fir out with some type of members a Z firring member so you get a cross hatch and that way avoid that transmission through the stud.

President Budzileni: Do we have any other questions? If not, thank you Mr. Jahn.

The next item on our program is Special Subject No. 1 and Mr. J.J. Horney will introduce that for us.

Mr. Horney: Thank you President Budzileni. The next topic we're going to talk about deals with the subject of changing ties on open deck bridges and trestles and the various ways thereof. It's a subject that the majority of you, I believe, are intimately familiar with because you've at one time or another performed the task at one level or another. And because of that I'm sure that you can agree with me that you can take one job and have five supervisors approach it and have the job done five different ways, each one successfully. Because of the complexity of the subject, I'd like not only to introduce Don Steele, but thank him personally for accepting this challenge and gathering the information, compiling it, and coming here today to give this presentation.

Don Steele is our general B&B supervisor assigned to Salina, Kansas. His territory of responsibility extends from Kansas City to Oakley, Kansas, and from Topeka to Grand Island, Nebraska. He has 735.2 miles of mainline track and 457.9 miles of branch line track for a total area of 1,193.1 miles that he covers. I don't know if you knew that or not Don. But with that I'll give you Don Steele and let him give the presentation. And if you'll give me a minute Don I'll see if I can get back there and coordinate your slides with the presentation.

Mr. Steele: Thank you John.

SPECIAL SUBJECT NO. 1

Installing Ties on Open Deck Trestles and Bridges

Chairman: D.L. Steele, B&B Supv., Union Pacific, Salina, KS
Committee: P.J. Lager, B&B Supv., Chicago & North Western, Boone, IA
E.B. Dobranetski, Engr. of Fac. & Struc., B&LE, Monroeville, PA

President Budzileni, Association members, and guests: after accepting the challenge of making this presentation, I began contacting anyone who would listen to me and help provide information about changing bridge ties.

Factors Determining Methods of Work

While talking with people on various railroads across the country, the overall opinion was that there are but two ways to change out bridge ties on open deck structures - either by the stick method, or by paneling. There are many variations on how each method is done. The reason for these variations is due to the many contributing factors that determine how the job can be accomplished. Some of these factors are:

Size and type of equipment

Location of bridge

Weather, with respect to the temperature of CWR or jointed rail

Double track or single track territories

Number of personnel available

Track time

Type of structure

Cooperation between departments

These factors, or a combination of any of them, will determine whether to panel or go by the stick method and how to approach either method. So, ultimately, it is up to the supervisor to make the most economical decision and keep the railroad in operation while doing it.

Now, let's go back and touch on each of the factors separately.

1) Size and type of equipment.

What type and how many cranes will you have at your disposal? Will you have a locomotive crane, so a panel job can be approached, or will you have a truckcrane, speedswings, or even a crab? Will you have spikedrivers and power wrenches, so fewer personnel are needed? Just this category alone can make or break a job. Yes, the job will still get done, but was it the most economical and expeditious way?

2) Location.

Is the bridge near a siding, so equipment can readily clear the track for train movements? Are your people able to get to the job site by off-track methods? Can you store your bridge material or panels near the job site? The height of the bridge, and if it is over water, will determine the appropriate safety precautions. Whether the bridge is on a curve or tangent track will determine the number of ties that can be removed at any given time.

3) Weather with respect to the temperature of CWR or jointed rail.

Extreme temperatures in CWR, or for that matter in jointed rail, can cause problems. In CWR territory, the number of ties that can be taken out at any given time is directly related to the temperature. If too many ties are taken out, or loosened, a sunkink will occur causing an unexpected delay for the job. For those of you that don't like the term "sunkink," thermal misalignment will suffice.

Also, we can make a division engineer mad if we cut up his CWR in order to make our job easier.

4) Double track or single track territories.

In double track territory, it may be possible to get unlimited track time. In single

track territory you are at the mercy of the train dispatcher for obtaining track time. Although a panel job can be done on either single or double track territory, you may have the advantage of using the adjacent track if in double track territory.

5) Number of personnel available.

This factor pretty much explains itself and is directly related to the size and type of equipment available. If less equipment is available, then more personnel may be required. Also, the number of personnel available will determine how long the job will take.

6) Track time.

I touched on this earlier, but this factor can ruin the economics of a job. This will be the major factor in determining whether you are able to panel a job or go by the stick method. It also determines if one rail or both rails can be removed, and, basically, how to approach the job.

7) Type of Structure.

There are basically 5 types of open deck structures:

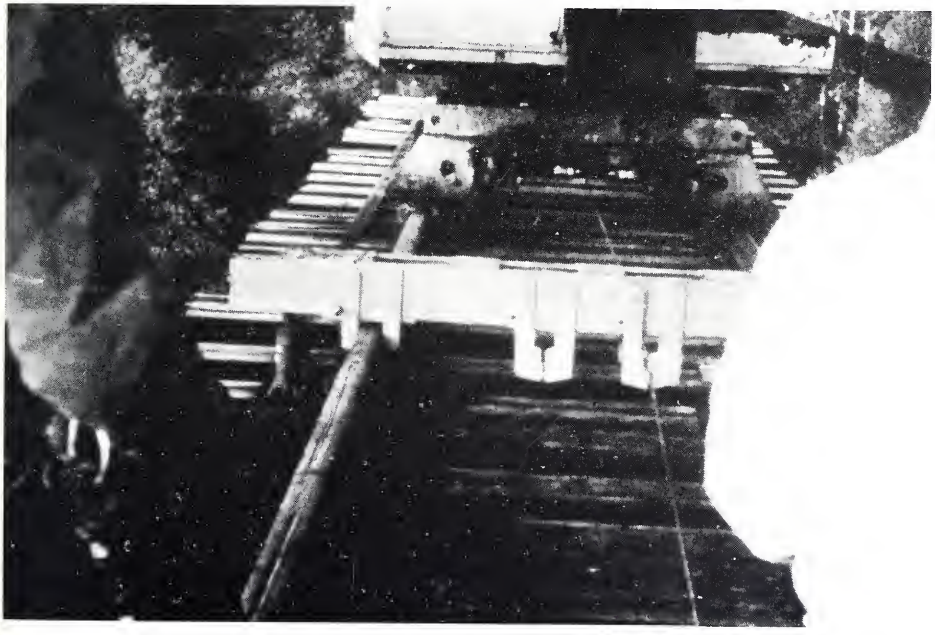
1) Timber Trestles
2) Beam spans
3) Deck plate Girders
4) Thru-plate Girders
5) Trusses

Timber trestles, beam spans, and deck plate girders all have the advantage of having unlimited side space so that the old and new ties can be taken out, or placed, by sliding them under the rails from the side. Timber trestles and beam spans offer little to no problems because they have a smooth, constant bearing surface for the ties. Deck plate girders, on the other hand, can have several cover plates with rivet heads causing a nonuniform surface.

Thru-plate girders and trusses both have the problem of side clearance. The rails have to be raised higher, so ties can be placed at a greater vertical angle, so they will clear the girders or truss members. In CWR territory, this work will have to be scheduled for early morning hours to avoid potential problems caused by high temperatures. In jointed rail territory, with enough track time, you may want to remove one running rail.

Setting ties in place.

Placing rail panel and ties in position.



Setting panel.

8) Cooperation between departments.

It is important for the B&B supervisor to schedule and coordinate a tie replacement job with other departments. It is convenient to talk with the trainmaster, so your material can be properly spotted and unloaded. The chief dispatcher should have advance notice such that trains may be scheduled to obtain longer track time. It's important to work with the roadmaster so that section gangs may be available for necessary track work, and have ballast cars available if grade raises are included in the job.

Panel Method vs. Stick Method

Let me point out some of the advantages and disadvantages of the panel and stick method of changing ties. The big advantage of using the panel method is that a lot of ties can be replaced in a hurry. For this system to work, both running rails must be removed requiring a good break in track time. Also, the ties must fit, especially if the bridge is a deck-plate girder and/or on a curve with super elevation in the ties. With the panel method, a substantial amount of time must be spent fabricating the panels. This time spent for fabrication may cause the overall cost of the job to be more expensive than the stick method.

The big advantage of the stick method is that it can be accomplished with short periods of track time. The disadvantage is that the actual installation may take longer and runoff shims may be required under the rail, especially if the depth of the new tie varies from the old tie.

Slide Show Examples:

Now for a few examples of these methods.

Case #1

We have a 138′ thru-truss that needs a complete deck installed. The bridge is in jointed rail territory. We have a truck-crane and an air compressor. There is a 6-man B&B gang and a roadway equipment operator. Track time varies, but usually you can get at least two hours.

First, a stumbling hazard is placed around the bridge area and a 10 MPH slow order is put on the bridge. Then, a Form "Y" is set up for the day that redecking starts. A Form "Y" is a train order for gang and equipment protection.

The inside guardrails are removed, then the anchoring system is removed, except for the bolts themselves. Pull the spikes on the running rail except those in the anchor bolt ties. (Usually leaving no more than two ties in a row unspiked.)

Remove one running rail and the outside guardrails in the area of the removed running rail. Jack up the opposite running rail and any rail ends that will interfere with the removal of ties. Jack up to where it's safe and ties can easily be removed. Remove the ties with the truckcrane stacking 6 or 8 ties over a cable just ahead of the crane. Remove these ties from the bridge and bring 6 or 8 new ties in and install them, then remove 6 or 8 more, and so on until all ties are installed in that removed rail section. Once a section of ties is removed, an effort should be made to inspect those portions of the bridge that may not be visible during routine inspections. Also, a few extra minutes can be put to use by putting a coat of primer paint on the top of the stringers. Place new outside guardrails to maintain tie spacing and install the rail, space ties, and install your anchor bolts. Lower the opposite rail, line and gauge the track, and spike down the running rail at the anchor bolt ties. Then proceed to your next section continuing until all ties are installed. Now install your inside guardrail spiking down at every bolt tie on the bridge and every 3rd or 4th tie off the bridge. Bring in your air compressor and finish spiking down the inside guardrail and running rails. Clean up the job site, and remove your stumbling hazard order and the 10 MPH slow order.

Now, a good policy to follow is to let some traffic run over the new deck for a couple of days and then come back and retighten the anchor bolts, for the ties will seat-in making the anchoring system loose.

Simple wasn't it? What if you didn't have a truckcrane, or you couldn't get two hours continuous track time, so a rail couldn't be removed. This would change the complexion of the whole job, therefore, producing another method.

If a bridge is in CWR territory and rail temperature could rise to approximately

120° F, a different procedure would be used. Replace all anchor bolts with bolts that are 3 to 4 inches longer and tighten up the anchor assemblies. This usually requires either a continuous threaded bolt or a bolt with a long thread area. When track time is made available, remove one section of outside guardrail on each side and drop bolts back into the anchor ties. Remove spikes from running rail and inside guardrail on about 6 or 8 ties. Start jacking up bridge deck keeping tension on anchor assemblies on either side of the area where the outside guardrail is removed. Jack until those 6 or 8 ties can be easily removed. Remove the ties and replace with the new ones. Lower the deck and gauge, line, and spike down. Jack the deck up again and do another 6 or 8 ties. Continue this until this section is done, and the outside guardrail is installed and anchor assemblies tightened. Then move onto another section of outside guardrail. One should be careful not to bump the rail, for it still can misalign on you even with these precautions.

Some railroads bolt every tie on a bridge with CWR, while others do every other tie, and still others go every 3rd tie.

If every other tie is bolted, the location of the anchor bolt could be changed, so you could jack up the deck and change every other tie, then lower the deck and spike the ties and install anchor bolts, the re-jack and change the remaining ties.

I'm sure there are many methods of changing out deck ties in CWR. So whatever works best for you, use it. This is just another idea, not necessarily the best one.

Now, here are a few more examples of changing out bridge decks:

Case #2

This is a new steel pile trestle.

The new deck is being installed. The deck is prefabricated in 16-foot sections on the job site. The deck is started at one end and rail installed as the deck is laid.

Note the steel "H"-Pile along side of the bridges. This is used as a place to sit to tighten the anchor bolts.

The rails are spiked every third tie, in this case every bolt tie. When the deck is completely laid, an air compressor is started, and a spikedriver is used to finish spiking the rail.

The last panel is being placed. The panels are held together with the outside guardrail already installed and #9 wire wrapped around each end of a tie and then looped up to the boat spike holding the outside guardrail. When the panel is laid, the anchor bolts are installed and wire removed.

Case #3

B&LE bridge.

This is a steel bridge with timber approach spans. At the time the new deck was being isntalled, all the timber stringers are checked and replaced as needed.

A portion of deck is removed, and one stringer is being replaced.

This shows the storage area near the job site.

A safety cable is installed across the bridge.

A portion of deck is removed over this steel span. This safety cable is in place.

The new deck is being installed with a bridge crane. The bridge crane has a push cart behind to use in removing the old ties off the bridge and bringing the new ties on. A boom truck is at the storage area to load and unload the push cart. Note the unique rail lifting device just in front of the bridge crane. This was made by the B&LE Railroad and is hydraulically operated.

A closer look at the rail lifting device. Note the men wearing the safety belts.

Case #4

Here is a paneling job underway. A panel is being removed. Notice the panel lifting jig with chains around each tie.

A new panel is being brought in with the panel lifting jig.

New timber is laid out in preparation for building new panels.

Completed panel is ready to be lifted with panel lifting jig.

Panels are in place.

Case #5

Here is a bridge near Clinton, Iowa. It has a truss and one swing span. A B&B hyrail gang truck is removing the old footwalk prior to new deck job. This truck has a small boom and is equipped with a small air compressor.

The locomotive crane is removing a panel. The rails are cut at random. The first

cut is usually a little over 39 feet, in order to be able to slip in a new 39-foot panel with ease. There is a man on the right with a tag line to help control the panel.

Panel is being lifted out.

As you will note, the crane is already running on newly laid panels. Tie spacing is being held by 2 × 4s, and anchor bolts are dropped in to hold line.

The old panel is being taken off the bridge and a new panel is brought in and laid.

The new panel is being brought in and is being laid in place.

Notice the small gap between the new panel and the old deck. At the end of a day's work, a dutchman is cut in so rail traffic can be resumed at night.

Clearing for traffic on opposite track.

Case #6

This is the Kate Shelly Bridge near Boone, Iowa. It is approximately ½ mile in length and 190 feet high. It was built in 1900 to 1901. Here, a Burro crane is removing running rails and has a panel removed. This job has 30 people working on it, including 3 B&B gangs, equipment operators, and some section people.

A panel is being removed. The Burro crane has a flat behind it to load the old panels.

While the Burro crane is removing old panels from one end of the bridge, a locomotive crane is installing new panels from the other end. Burro panel tongs are being used to carry the panel. Men are spread out across the bridge, removing the old anchoring system, as well as installing the new system. The outside guardrail is not installed until all panels are laid.

A truckcrane is being used on the adjacent track to remove rail that the Burro crane lays alongside the track. This is done as track time is made available.

A new panel is being placed.

Men are drilling holes and installing the anchoring system. Notice the rail on the right. This is the rail the truckcrane picks up.

Drilling holes and installing anchor bolts.

A new panel is having its ties spaced to prevent them from hitting the footwalk outlookers.

Another panel is ready to come in. Notice the two air compressors on the left. They are hooked up in tandem to provide air for the drills and wrenches.

Tightening the new panel.

A panel is being laid. You can see the flat car behind the Burro with three old panels on it.

Panels laid with anchor bolts installed.

Removing second to last panel. Here the truckcrane is doing it.

Prepping for the last panel.

Just a pretty sight of a job almost done.

The last panel laid and a lot of smiling faces.

Case #7

Here we have an 80-foot thru-plate girder in Eastern Colorado. We have a 6-man B&B gang, a 3-man section gang, and a speedswing. Men are loosening the inside guardrail for removal.

Inside guardrail is unbolted.

Anchor bolts can at times be very stubborn and have to be removed with equipment.

One rail is removed. A jack is placed on the floorbeam to raise the opposite rail.

Ties are being bunched prior to removal with a sling.

Ties are being removed.

Ties are being installed. Notice men are standing on 2 × 12s placed between floor beams.

Ties are being hauled in.

Ties are being pulled out. Note two men are giving signals. That's bad.

Rail is being put back.

Outside guardrail is being laid.

Anchor bolts are being installed.

Boat spikes are being driven.

Tightening anchor bolts.

Using a rachet wrench to tighten bolts.

Laying out new inside guardrails.

Tie plates for inside guard rails are in place. Notice every 3rd tie is spiked on running rail.

Starting to lay inside guardrail.

Bolting inside guardrail.

Spiking down inside guardrail every 3rd or 4th tie.

Bringing in the air compressor to fully spike running rails and inside guardrail.

Driving the rest of the spikes.

Deck is installed.

No job is done until job site is cleaned up.

Taking tools back.

Safety

One aspect that has not been covered, and it is a very special item, in changing out decks, or for that matter, doing any type of bridge work. That is, the aspect of safety. This is something each and every supervisor should be concerned about. If an injury occurs on a job, it is not a job well done.

Each railroad has its own edicts on what is required for safety while working on a bridge. Also, several states, especially Washington, have strict requirements regarding bridge safety. Some railroads only require a good foot and hand hold, while others may require a boat with two men in it in case someone falls into the water. Safety is a growing concern and something that shouldn't be avoided.

There are many safety devices available that can be utilized while working on a bridge. Some of these are:

1) Safety belts, lanyards, and life lines.

2) Scaffolding, or suspended platforms with handrails, and yet, even with this, safety belts should be used.

3) Safety nets are another alternative.

4) Life jackets may be used with ropes and buoys strategically placed on and about the bridge.

5) Having a manned boat available may even be required.

We on the Union Pacific are in the process of establishing a Chief Engineer's Bulletin concerning safety devices to use on a bridge. It will state when and what type of safety equipment is necessary, along with specifications on the strengths of this equipment; generally, it will comply with Government requirements. What I'm trying to say here is, safety on the Union Pacific is very important. In fact, safety is the #1 accountability for any field supervisor on the Union Pacific.

Other Considerations

Even though I have only touched on this subject, it is the most vital area of all and should always be given the utmost consideration.

A couple of other items I have been requested to cover are the pros and cons of dapping ties and the different types of bridge tie anchoring devices being used.

As for the dapping of ties, each and every railroad has its own standards. One railroad says it is not worth the extra expense and feels the dap creates a weak point in the tie; therefore producing split ties. Other railroads use the dap for surface and to assist in holding line. Though this can be a very controversial subject, the dap is primarily used to hold a true surface over a bridge.

Some railroads, instead of using dap, have the overall length of the ties framed to the required surface that is needed.

As for the cost variance, I do not have this information, but it possibly should be something to be measured.

For those who feel the dap holds line on a bridge, maybe one should try just framing ties to meet the required surface and then apply additional anchor assemblies to assist in holding line.

As for the different types of anchoring devices, there are many. All I can say to you is, if it works and it works to your satisfaction, "use it." If you have any doubt, try someone else's.

Now, as for the different types that have been successful, here are a few suggestions:

1) "Evertight assembly" by Lewis Nut & Bolt. This assembly consists of a shoe that conforms to your steel and a spring washer and nut.

2) "Spring Clip" by the Rail Company which consists of a formed piece of plate steel that will, when tightened, have some give to it, not making the deck rigid.

3) "Hook bolt" which is a bolt with a hook at the bottom that grips the steel and a nut at the top for tightening.

I do not feel that a set method of changing ties can be established for each type of bridge. Each job has its own variables and is something that should be up to the supervisor for consideration, as every job will require its own unique method. For those of you looking for advice, the only advice I can give is, don't fry your bacon in the

nude. The only method I can say that should be followed is the safest method.

Thank you.

President Budzileni: Are there any questions for Mr. Steele?

Daryl Bryant: Do you have any feel for the cost in manhours or ties installed, the overall cost?

Mr. Steele: No, I did not do a study on the cost on this. It is something that should be measured one of these times. There are some railroads that state that they can do better economically with the panel methods, where others state they can do better with the stick method. But it just depends on the job, the variables I've shown on it. Can you get the track time? Track time is just something you can't measure. Any other questions?

Don Lewis, ICG: In your gathering information, did you ask for or have any information supplied as far as pre-boring?

Mr. Steele: No, I did not.

Member: The holes that were bored in the field, I didn't notice any preservative in any of those. I presume those ties came from a different railroad. Is it the practice of your company not to put any field preservative in the raw wood where it is exposed?

Mr. Steele: On our railroad we do not apply preservatives in the hole that's drilled. And as for the other railroads, I do not know.

President Budzileni: Thank you Mr. Steele and thank you too, John, for helping out. Mr. Bessey will introduce our next special feature.

Mr. Bessey: Our last special feature before lunch break is a new swing span on the Northeast Corridor, Amtrak, and this will be presented by Mr. K.P. Felsburg, who is Senior Director of Engineering Construction, for Amtrak. Mr. Felsburg is in charge of all contract construction work for the Northeast Corridor. Mr. Felsburg has a B.S. in Civil Engineering and is a registered professional engineer in New Jersey, Pennsylvania and New York. He has 30 years experience in general construction and the railroad industry. He has been with Amtrak since 1977. Mr. Felsburg.

Mystic and Shaw's Cove Bridges Float-In Operations

K.P. Felsburg, Jr.,

Senior Director — Engineering Construction, Amtrak

The Northeast Corridor Improvement Project which began in 1977 and is scheduled for completion in 1986 has a budget of 2.19 billion dollars, of which 179 million dollars is identified for bridge work.

Two Major Projects

Two major bridge projects very close to completion are the Mystic River and Shaw's Cove drawbridges, both in Connecticut and both complete replacements of existing bridges. Built around the turn of the century, both had swing spans and fixed approach spans which were in extensive states of deterioration.

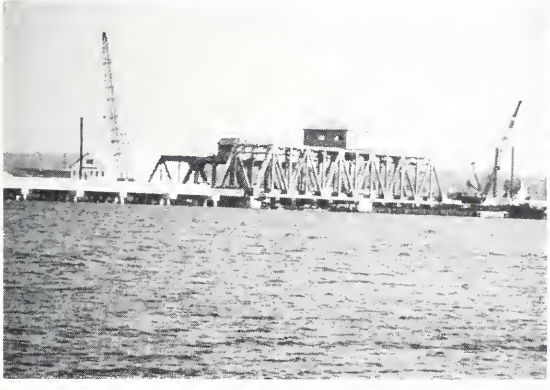
Both bridges were replaced by new crossings off-line and south of the existing crossings. Both now consist of new fixed approach spans and moveable swing spans.

The final cost of the Mystic River project will be approximately 18.4 million dollars and the Shaw's Cove project will be approximately 14.2 million dollars.

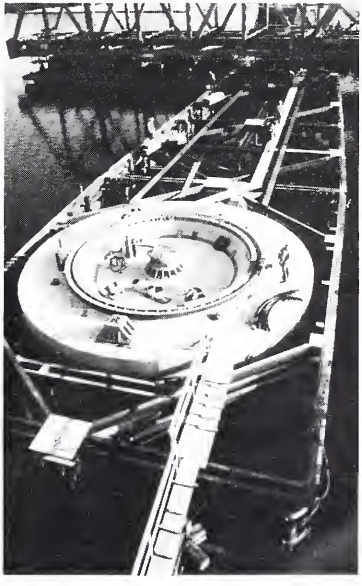
The construction method for both draw spans was unique in that both were built off final location and floated into place. This was necessary in order to satisfy the Coast Guard requirement of limited channel closings during the winter months.

Mystic River Bridge.

Mystic River Bridge swing span.



Mystic River Bridge swing span in place.



Mystic River Bridge pivot pier.

The Mystic Bridge Construction

The new Mystic Bridge consists of a 263-foot through truss swing bridge including two 47-foot deck girder flanking spans and twelve 50-foot ballasted deck concrete box girder approach spans. In addition, there is a 200-foot pile supported concrete trestle east of the river crossing in an area that is unsuitable for embankment-type track support.

The contractor for the new swing span bridge opted to have the swing span fabricated in Keasby, N.J. on barges, while the approach spans were constructed on site.

About 6:00 a.m. on Wednesday, February 1, 1984, the 1,200-ton swing span was eased away from the dock in New Jersey by a seagoing tug, and was towed up the Long Island Sound to New London Ledge Lighthouse, where it arrived about mid-morning on Thursday, February 2, 1984. The seagoing tug was replaced at this point by smaller tugs for the final leg up the Mystic River.

Early Friday morning, February 3, 1984, the swing span was in position to be maneuvered into place with the morning high tide. By noon, the float-in of the swing span was successfully accomplished.

Shaw's Cove Bridge

The new Shaw's Cove Bridge consists of a 220-foot through truss swing bridge including two 57-foot + plate girder open deck flanking spans and a 277-foot ballasted deck plate girder approach span.

The Shaw's Cove Bridge contractor fabricated the 220-foot swing span, adjacent to Shaw's Cove, for the ultimate float-in operation. About 8:00 a.m. on Monday, April 2, 1984 the 865-ton swing span was moved into position over the pivot pier with the incoming high tide. As the tide ebbed, the swing span settled into position at approximately 12:30 p.m.

These two projects make a major contribution to the upgrading of the Northeast Corridor, thus increasing Amtrak's safety and reliability.

President Budzeleni: Thank you Mr. Felsburg and Mr. Bessey for that very interesting float operation and the various problems encountered.

This session is adjourned until 1:30 P.M. Remember, we will be meeting right here after lunch in the Adams Ballroom.

Meeting adjourned until 1:30.

TUESDAY AFTERNOON

September 25, 1984

President Budzeleni: Welcome to the continuation of the second session of this conference. Will everyone please be seated and will one of you gentlemen back there please close the doors. Thank you.

I would now like to call on Mr. Denz, our immediate Past President to introduce all past presidents who are in attendance today. Mr. Denz.

Mr. Denz: Gentlemen, the current membership of our American Railway Bridge and Building Association is indeed indebted to the many officers of the Association who have served in the past. It has been through their many endeavors and sincere efforts that our Association has progressed so well for nearly a century now. It gives me much pleasure to be able to give recognition to the more recent past presidents who are in attendance. As I call the name of each past president, I ask that he stand and remain standing until all have been introduced. Mr. H.M. Wilson 1965-66; R.D. Helleweg 1966-1967; N.D. Bryant 1972-1973; E.E. Runde 1973-1974; J.R. Williams 1975-1976; W.C. Sturm 1978-1979; Let's give these gentlemen a generous round of applause.

(Applause)

President Budzileni: Thank you Mr. Denz. On behalf of the Association I thank all of you for being present.

I would now like to call on Mr. Bessey to introduce the next special feature and our guest. Mr. Bessey.

Mr. Bessey: The next presentation is entitled "U.S. Coast Guard Report - River Navigation." Approximately three years ago, a meeting was held in St. Louis, attended by representatives from all of the railroads in the Second Coast Guard District, tow boat owners, and representatives of the Coast Guard. there were approximately 50 people in attendance at that meeting, and follow-up meetings have been held at various locations around the State of Illinois.

The purpose of these get-togethers was to discuss our common problems and to get a better understanding as to what each other's problems are. I believe setting up a better line of communication between railroads, boat owners, and the Coast Guard has been very beneficial. The railroads and boat owners have always been arguing with each other, but now since these get-together sessions, and improving our communications, we still argue, but our arguements are higher class.

To make this presentation this afternoon is Roger K. Wiebusch, Chief, Bridge Branch of the Second Coast Guard District from St. Louis. Prior to this assignment, he worked in the branch office dealing with permit function, navigation lighting, and bridge construction. Prior to 1978, Mr. Wiebusch was with the Chicago District Corps of Engineers, and, prior to that, served on active duty in the Coast Guard as a navigation and operations officer in Alaska. He received his B.A. from the University of New Hampshire and Master's Degree from Southern Illinois University at Edwardsville.

Mr. Wiebusch.

U.S. Coast Guard Report River Navigation

by

Roger K. Wiebusch

Chief, Bridge Branch

Second Coast Guard District

St. Louis, MO

Good afternoon. I appreciate the opportunity to address this group on friendly terms. It seems that most of the time the conversations between railroad B&B personnel and my office occur immediately after a commercial tow has just destroyed the newly renovated protection system of one of your bridges. You are upset and question the competency of the boat's pilot and want the Coast Guard to take positive, corrective action to prevent a recurrence. Later, I often talk to a representative of the towboat industry who, just as emphatically, tells me the Coast Guard must take some positive action to correct the problem caused by the bridge to prevent a recurrence of the accident. Regardless of the cause, collisions between commercial towboats and bridges are a mutual concern of your industry and the Coast Guard.

The Coast Guard's Bridge Administration Program has three main parts - all of which affect railroad bridges:

1. Issuance of permits for construction of new bridges or modification and repairs of existing bridges. This includes approving construction and demolition plans.
2. Promulgating, revising, and enforcing drawbridge operation regulations.
3. Investigating bridges under the provisions of the Truman-Hobbs Act to determine whether they are unreasonable obstructions to navigation.

The Second Coast Guard District administers this program in a 22-state area which contains 12,000 miles of navigable waterways. Crossing these waterways are over 1,400 fixed bridges and 153 drawbridges. Most of these drawbridges are owned by railroad companies, and most of my day-to-day problems - our problems, are caused by these drawbridges.

These bridges were usually authorized by specific Acts of Congress and constructed to provide for the reasonable needs of navigation - as the engineers and planners then forsaw the future. The daily problems we deal with today concerning the navigational problems created by these bridges are a result of those early planners failing to adequately anticipate the future. I am not faulting their actions - I believe they did as well as they could, given the existing situation, reasonable assumptions, and resources. The bridges were built to accommodate the existing river navigation - the packet boat, log rafts, and other small wooden craft. As a result, the horizontal clearances provided by these bridges vary from approximately 113 feet to 150 feet. The associated protection systems were also a reflection of the watercraft expected to use the bridge. Most drawbridges relied upon wooden sheerbooms and sheerfences to protect the vessels and the bridge.

Most railroad bridges which cause navigational problems today are swing spans which were constructed before the existing locks and dams were built. Construction of the locks and dams provided for a stable navigational environment. This led to changes in the type, size, construction, and horsepower of river vessels. Wooden vessels, packet boats, and log rafts have been replaced by large steel towboats possessing 1,200-5,600 horsepower, pushing up to 15 barges. A typical tow on the Upper Mississippi River or Illinois Waterway consists of 15 barges, arranged five long and three wide. Each barge is 195 feet long and 35 feet wide making the typical tow 975 feet long and 105 feet wide plus the length of the towboat. Each loaded barge contains 1,500 tons of cargo with a 15-barge tow being 22,500 tons. This is not the type or size of vessel your predecessors envisioned would use your bridge. As B&B personnel, you are all aware of the damage that results when a 22,500-ton tow moving downstream misses the center of the 150-foot navigation span and hits a wooden protective structure.

Today, large tows are transitting bridges which have narrow navigation spans. In general, the navigation channel on both the Upper Mississippi River and Illinois Waterway are at least 300 feet wide. However, in these same areas, the navigation spans on the problem drawbridges provide between 202 feet and 113 feet of horizontal clearance.

Compounding this problem of narrow navigation spans is the fact that many of these "bad" bridges are located in bad locations - either in or near bends in the river. Some bridges are also skewed to the desired sailing line of the river. Two examples are the Fort Madison Railroad and Highway Bridge (owned by Santa Fe), and the Sabula RR Bridge (owned by Milwaukee Road). Localized river currents or sets at particular bridges and wind affect tow movement. Often it is not just one set, but two sets which tend to push the tow different directions - one just upstream of the bridge the other within the span itself. Each of these physical external factors acting on a tow during the critical time when it is passing through the narrow navigation opening can cause the tow to contact your bridges or protection structures.

Another navigation problem associated with drawbridges is the speed of vessel approach. This is a problem mainly for downbound tows traveling with the current. In order to effectively steer a boat, the boat must be moving through the water. When coming downbound, this means going faster than the current is pushing the boat. This does not present a problem until you're approaching a narrow navigation span. I order to keep effective steerage, you should keep the "pedal to the metal" - go full out. However, discretion tells you to slow down, and pass through the span slowly. By doing this, possible bridge damage may be decreased, but the boat is more subject to the impacts of wind and current.

The present day situation faced by us is one of conflict between wide tows passing through narrow navigation spans. The basic

navigation problems which exist at drawbridges are:

1. Narrow navigation span.
2. Poor location across river.
3. Effects of wind and current set on tows passing through span.
4. Responsiveness of drawtender -how soon is the bridge opened.
5. Pilot error.

Collisions between commercial tows and railroad drawbridges are costly to both modes of transportation and potentially endanger the local communities. A major concern which arises after every such collision is what can be done to prevent future collisions, what can be done to make the bridge safer for the transit of commercial tows.

The obvious answer to this question is to structurally alter the bridge to correct the obstructive characteristic. Often times, this would mean changing the bridge from a swing span with two 150-foot navigation span to one with a single 300-foot wide lift span. However, this is a very costly undertaking.

Within the second Coast Guard District we have used a cheaper and simpler approach in attempting to solve this problem. Our method is not revolutionary. It is a tried and true method which emphasizes communications and cooperation between bridge owner and operator and the towboat industry. We hold meetings to discuss reasons for the collisions with drawbridges on the Upper Mississippi and Illinois Rivers. The object of the meeting is to openly discuss problem areas, to exchange information in a constructive manner and work toward a solution. The first meeting held was in St. Louis. It was general in nature and did not focus attention on a particular bridge, but discussed in general the problems of bridge owners and towboat pilots.

There are some common problems that apply to all drawbridges. These include the bridge owner's responsibility to never allow the bridge to unreasonably interfere with river navigation. This is the basis for granting authority to construct the bridge in the beginning. This means the bridge owner must promptly open the bridge for the passage of river traffic upon receipt of proper signal. All bridge owners are also required to maintain the bridge and its appurtenant protection structures in the authorized condition - as set forth in the permit drawings. If some structure is damaged, it must be promptly repaired.

Some of the recommendations which resulted from the general meeting were:

1. Delays in opening bridge spans contribute to accidents by causing tows to get out of shape. Arrival points for tows above and below each drawbridge need to be established. A boat would not proceed beyond the arrival point until assured the span was open and would remain open until boat cleared the bridge.
2. Navigation lights on bridges must be diligently maintained. The Coast Guard should establish additional aids when determined necessary upstream or downstream from bridges to assist tows in aligning for passage through the drawspan.
3. Increased communications between drawtender and boat pilot. Pilots need to give accuarte arrival times, and tenders need to promptly open bridge unless they correctly and promptly signal the boat they cannot.
4. Channel maintenance can contribute to collisions by making the tow follow the deep water and not the desired course in approaching a bridge. This is a matter under Corps of Engineers' jurisdiction and requires coordination with that agency.
5. Control of the vessel needs to be improved and emphasized. Adequate horsepower for vessels and adequate training for vessel pilots is very important.

As a result of this meeting, additional meetings were scheduled to discuss particular problems at specific problem bridges. Meetings were held concerning the Fort Madison Railroad and Highway Bridge owned by Santa Fe Railroad and the Sabula Railroad Bridge, owned by the Milwaukee Road Railroad. Both bridges are swing spans which cross the Upper

Mississippi river, and both are considered "bad bridges" especially during high river stages.

Both meetings were similar in discussions and problem areas. As an example of this type of meeting, I'd like to briefly discuss the recommendations made about the Sabula Bridge. Meeting attendees included railroad personnel, professional pilots, and Coast Guard personnel representing different program areas.

The recommendations made as a result of this meeting were:

1. Paint five bridge focal points high visibility yellow.
2. Install windsocks on 10-foot supports on the upstream and downstream pivot protection bullnoses.
3. Extinguish white lights used by bridge operator to align rails except when necessary to close bridge.
4. The Coast Guard would assist in preparing steering directions to assist pilots in transitting the bridge.
5. The Coast Guard would issue cautionary Notices to Mariners when weather and current conditions make transit of the bridge especially hazardous.

All of these recommendations with the exception of preparing steering directions have been implemented at Sabula. The only different recommendations made at the Fort Madison Bridge meeting were the establishment of arrival points for downbound tows and the installation by the Coast Guard of fixed lighted aids upstream and downstream from the bridge. Two arrival points were established, one from which to signal for a bridge opening, the other to serve as a "go/no go" spot. Unless the bridge was open, a vessel wouldn't proceed downbound past this second point. This was not required at Sabula, since early bridge opening was not a problem.

The implementaion of the recommendations has not eliminated marine collisions at these two bridges. I don't believe there are any steps which can be taken short of altering the bridges which would eliminate all collisions under all circumstances. Periods of high river flow rates (in excess of 100,000 cubic feet per second) will always cause severe navigational problems at these bridges due to their skewed relationship to the vessel's desired sailing line and severe sets which exist in the vicintiy of the bridges. The effects of wind upon empty barges, the direction of tow is moving (upstream or downstream), pilot judgement, or horsepower and mechanical or power failures of the vessel may always contribute to and cause collisions.

However, implementation of the recommendations has helped to eliminate some accidents - both during high river stages and normal stages. Any improvement to the navigational problems created by a bridge will result in fewer collisions and less money spent on repair and litigation. From the waterway users' standpoint, implementation of these relatively cheap recommendations has improved their ability to successfully transit these bridges.

The most important aspect of our methodology is that it brings together the two sides of the problem - bridge owner/operator and the boat pilot. By discussing their concerns, problems and limitations mutually agreeable solutions to a major problem were reached and then implemented. A bridge represents the intersection of two conflicting modes of transportation. A drawbridge, especially a swing span bridge built around the turn of the century, accentuates this conflict. These meetings have proven to be a successful way of mitigating this conflict to accepatble levels. It is a system we will continue to produce benefits to both the bridge owner and the towboat operator.

Thank you.

President Budzileni: Mr. Wiebusch is willing to field questions from the audience if anyone has any questions.

Fred Day, Conrail: We have a few drawbridges, about 55 or 60, we are sort of in an adversary position with the boats all the time, because the boats take our business away. What I would like to know is, we're in the same position with the 1,900 drawbridge or swing bridges, as you have mentioned, as we are with many 1,900 overhead bridges carrying highways and trucks.

Now why should we let the river traffic expand, and expand, and expand to what you're showing on slides with three possibly four barges wide and anywhere from four to eight barges long and try to get them through the skinny opening. Why don't we limit the number of barges in permanent tow to fit what the bridge was built for or else ask them to build a new bridge for us?

Mr. Wiebusch: Well, let me try to answer that. First of all, the reason that bridges should be altered, or made wider, or be required to be less an obstruction to navigation as possible goes back to the original permit of the bridge. The waterway is a public thoroughfare to move commerce. The permit for the bridge gives you authority and authorization to encroach upon that public thoroughfare. You own the right-of-way up to the side of the river, you don't own the right-of-way across the river. The permit gives you the justification or the authorization to put structures within the public right-of-way and it's deemed that since the waterway is a public thoroughfare, the public has a right to use it, which means the barge lines or whoever wants to use the river. And so, therefore, if you're interfering with a public right to use the waterway, then that's where the conflict comes.

Mr. Day: I understand all that. But when the government issued the permit in the first place, they put the stamp of approval on it and said that this is a big size, good job. To us it doesn't mean that every 15 or 20 years, or 50 years, or 100 years that we're going to rebuild the bridge to make it bigger because the traffic gets bigger. We can't afford to do that. Government has more money than we have. That's the argument.

Second question is, we sent a lobbyist down to Washinton about five years ago. They tried to get the Coast Guard to take over maintaining the fender systems. What became of that? Are you aware of that situation?

Mr. Wiebusch: No I'm not. I'm not aware of that. I know the Coast Guard was involved in putting out a book that addressed fender systems, but I don't know of anything at all that talked about the Coast Guard taking over the maintenance or the operation of the fender systems at all.

Mr. Day: Well, help us out, will you?

(Laughter)

President Budzileni: Thank you Mr. Wiebusch and Mr. Bessey for that interesting presentation.

I would now like to call on Mr. Denz as past president and chairman of the Nominating Committee to present the slate of candidates recommended for consideration as officers. Mr. Denz.

Mr. Denz: Thank you Jim. The Nominating Committee respectfully submits to the membership the following slate of officers and directors with the recommendation that they be elected for the term specified. For President, J.M. Williams, Elgin, Joliet and Eastern Railway; for Senior Vice President, D.A. Bessey, Chicago, Milwaukee, St. Paul and Pacific Railroad; for Junior Vice President, J.T. Kapp, Conrail; for Junior Vice President, D.J. Lewis, Illinois Central Gulf; for Treasurer, P.H. Saletnik, Chicago and North Western Transportation Company; for directors with term ending 1987, D.W. Brookings, Kansas City Southern; W.P. Cunningham, Missouri Pacific; and J.H. Smith, Illinois Central Gulf.

President Budzileni: You have heard the slate of nominees recommended by the Nominating Committee. I will accept a motion that the Slate submitted by the Nominating Committee be elected.

Member: I move that the slate submitted by the Nominating Committee be accepted.

President Budzileni: Do I hear a second?

Member: Second.

President Budzileni: The motion has been made and seconded that the slate of candidates recommended by the Nominating Committee be elected to the offices specified. All in favor, signify by "Aye." Those opposed signify by "Nay." The "Ayes" have it. I hereby declare these officers duly elected. Will the new officers and directors-elect please stand to be recognized?

(Applause)

Thank you gentlemen. We will now proceed with our Business Session and provide the necessary reports. If there are any questions concerning any one of these reports, I

request that you hold your questions until after all reports have been given.

Will our efficient and amiable secretary, Mrs. Pat Weissmann, please give the Secretary's Report. Pat.

Mrs. Weissmann: Thank you President Buzileni.

MEMBERSHIP REPORT

September 1, 1983 to August 31, 1984

			1984	1983
ACTIVE MEMBERS				
Total Active members, September 1, 1983		455		
New Active members since September 1, 1983		57		
Reinstated		4		
LESS: Transferred to Life	19			
Dropped	32	51		
TOTAL ACTIVE MEMBERS			465	455
ASSOCIATE MEMBERS				
Total Associate members, September 1, 1983		90		
New Associate members since September 1, 1983		8		
Reinstated		1		
		99		
LESS: Dropped		8		
TOTAL ASSOCIATE MEMBERS			91	90
LIFE MEMBERS				
Total Life members, September 1, 1983		160		
Transferred from Active		19		
		179		
LESS: Dropped	1			
Deceased	8	9		
TOTAL MEMBERS			170	160
HONORARY MEMBERS			10	10
TOTAL MEMBERS — ALL CLASSES, August 31			**736**	**715**

President Budzileni: Thank you Pat. Since Mr. Saletnik, our Treasurer, is unable to be here, I'll ask Mr. Wally Sturm to present the Treasurer's Report. Wally.

Mr. Sturm: Thank you Jim.

TREASURER'S REPORT
September 1, 1983 through August 31, 1984

Cash on hand, August 31, 1983		$ 9,715.52
RECEIPTS		
Dues	$ 6,992.00	
Advertising — 1982	3,437.50	
1983	12,569.99	
1983 Conference Receipts	912.21	
Miscellaneous	193.65	
Interest on checking account	217.96	24,323.31
		34,038.83
DISBURSEMENTS		
Salaries (secretary & clerk)	$ 6,675.84	
FICA (on payroll)	457.74	
Illinois Department of Labor	24.93	
IRS FUTA Tax	44.79	
Office rent, telephone and electric	815.68	
Office supplies	347.12	
Equipment rent and repair	123.46	
Equipment purchase	221.26	
1982 Proceedings	5,997.26	
Stationery and printing	773.03	
Postage	640.00	
Advertising — 1982	4,129.50	
1983	2,670.57	
1983 Conference	355.25	
Executive Committee Meeting	280.47	
Membership Certificates	100.21	
Fire insurance premium and inspection	13.30	
Miscellaneous	449.80	
Bank charges	29.07	24,149.28
Cash on hand, August 31, 1984		**$ 9,889.55**

President Budzileni: Thank you Wally. I'll now call on Mr. J.R. Williams to present the Auditing Committee's Report. Jack.

Mr. Williams: Thank you President Budzileni.

TO: MEMBERS OF
THE AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION

Gentlemen:

The undersigned have examined the books of the Secretary and report of the Treasurer for the period September 1, 1983 through August 31, 1984 and have found them to be correct as of August 31, 1984.

Respectfully submitted,

J.R. Iwinski, Chairman

J.R. Williams

H.M. Wilson

President Budzileni: Thank you Mr. Williams. Mr. Davidson, Chairman of the Necrology Committee will now give his report. Jim.

Mr. Davidson:

To the President and Members of the
American Railway Bridge and Building Association:

It is with grief and regret that we report the known loss of eight members through death during the past year. It is possible that other members have passed away during the year of whom we have no information. If you know of any, please report their names to the Secretary. The following have been reported since our last Annual Conference in September 1983:

LIFE MEMBERS	TITLE-RAILROAD-LOCATION	JOINED	DECEASED
F.T. Alley	Engr. Bridge Maintenance Southern Pacific Houston, TX	1955	1984
S.A. Cooper	Chief Engineer Illinois Central Gulf Mobile, AL	1959	1983
W.P. Hendrix	Sr. Structural Engineer Penn Central Mission Viejo, CA	1954	1984
R.F. Moris	B&B Supervisor Norfolk & Western Ft. Wayne, IN	1955	1983
N.E. Peterson	Chief Engineer Chicago & Illinois Midland Billings, MT	1938	1984
F.E. Tardy	Sr. Asst. Division Engineer Southern Pacific Tucson, AZ	1958	1984
M.A. Wohlschlaeger	Engr. Grade Separations Missouri Pacific St. Louis, MO	1958	1984
F.R. Woolford	Consulting Engineer Western Pacific San Fransisco, CA	1950	1983

Respectfully submitted,
J.W. Davidson, Chairman

President Budzileni: Thank you Mr. Davidson. Are there any questions regarding these reports as presented by the Secretary, Treasurer, Auditing Committee, or Necrology Committee? If not, I will request a motion that these reports be approved as given.

Member: I move that the foregoing reports be approved as presented.

President Budzileni: Is there a second?

Member: Second.

President Budzileni: The motion has been made and seconded. All in favor signify by saying "Aye"; those opposed "Nay." The motion is carried and the reports are approved.

Let's move along to Special Subject No. 3, which will be introduced by the sponsor, Tom Kuhn. Tom.

Mr. Kuhn: I would now like to present Mr. Don Lewis, Senior Structural Designer with the Illinois Central Gulf, Chicago, Illinois. Don is going to talk to us today on Replacement of Timber Trestles with Permanent Structures. Don.

SPECIAL SUBJECT NO. 3

Replacement of Timber Trestles with Permanent Structures

Chairman:

D.J. Lewis, Sr. Structural Designer, Illinois Central Gulf, Chicago, IL

Committee:

W.E. Brakensiek, Assistant Chief Engineer-Structures, Missouri Pacific, St. Louis, MO

B.T. Burns, Steel Bridge Inspector, Atchison, Topeka & Santa Fe, Topeka, KS

R. Evans, ARMCO, Inc., Chicago, IL

D.K. Franz, Bridge Inspector, Milwaukee Road, Chicago, IL

J.S.C. Frost, Engineer-Bridges & Structures, British Columbia R.R., Vancouver, BC

D.L. Steele, General B&B Supervisor, Union Pacific, Salina, KS

R.A. Tallent, Jr., Process Engineer-Structures, Southern R.R., Atlanta, GA

S.S. Uppal, Regional Engineer B&S, CN Railroad, Winnipeg, Canada

C.R. Wahlen, Bridge Engineer-Systems, Atchison, Topeka & Santa Fe, Chicago, IL

C.S. Yordy, Sr. Structural Inspector, Conrail, Philadelphia, PA

Earlier Studies

Today's topic is one we all recognize may be the "State of the Art" in our railroading future. In 1975, Mr. J.G. Robertson presented "Trends Toward Bridges Built with Combination Timber, Concrete and Steel Components." His topic indicated that the main goal was economy in bridge design. We all know that the availability of adequate construction materials greatly affects this economy. He then discussed different materials for varying components of a bridge. Some of these items were end-bearing or friction type piling (used in pier footings or bents), types of caps and bulkheads, different types of beams for the main span, and different types of decks. In closing, he noted "You have a lot of choices when replacing portions of an existing bridge or constructing a new one."

A couple years later in 1977, Mr. F.D. Day presented "Effect of Unit Train Operation on Bridges." He presented a typical unit train and how it imposed wear and tear on our bridges. For his presentation, a survey was conducted and the results indicated that the railroads were having increasing problems with their timber trestles. Examples were presented indicating the effects of unit trains and the overall recommendation was to "change bridge design to heavier, more solid construction for future unit train loads."

We all recognize there are other items besides unit trains which have detrimental effects on our timber trestles. Such things as age, larger, or heavier cars such as Schnabels, changes in stream flow, increased debris, construction procedures which may necessitate larger openings while accommodating traffic, or lack of future construction, fire damage and, the ever-present decline of good, large size seasoned timber at an economical price. Therefore, it would be sound engineering practice to re place these timber bridges with permanent structures.

Modern Alternatives

What are these permanent structures? Well, the best which we could all strive for would be to fill the bridge. Associated with the filling of the bridge might be some type of culvert (steel or concrete), or there may even be openings for cattle or vehicles. Since filling of bridges is in the minority, let us look at the all-steel or all-concrete trestle.

Fill

Pipes

Concrete Structures

The Missouri Pacific Railroad has presented reasons for their concrete trestle to a few different organizations and, if I may quote from their presentation, "Each railroad has its favorite type, and each is convinced that it has the best and most economical bridge that can be built." This statement generally indicates the results I received from different railroads.

Let us now look at the general configuration of a concrete trestle. The bridges have been in existence since the 1920's constructed as conventionally reinforced concrete slabs, but in more recent years, they have generally been constructed with precast, prestressed components. The length of the spans vary and their configurations are different, as seen in the following slides:

Here is a solid slab (including curb) which requires two girders per track. The slab is approximately 36 inches deep under the track and approximately 12 feet wide. These spans generally range from 18 to 28 feet in length. One limiting factor to the design of this span may be the equipment the individual railroads have to handle these heavy spans. Another railroad employing a solid slab configuration has spans which consist of two 12-inch deep, 7-foot wide slabs for a standard 14-foot panel length.

Another configuration employed by railroads is the 1966 AREA Chapter 8, Part 17 "Prestressed Concrete Railroad Trestle." This standard trestle employs 2-double box girders per track for 28-foot spans. One railroad employs a similar type of box girder utilizing three 51-inch deep by 51¾-inch wide box girders per track. This girder section is for a 50-foot span, but the general design can vary for spans from 16 to 60 feet in length. The individual girders are held together using one inch diameter tie rods, epoxied into a single unit and then placed on the pier caps using a specifically designed gantry crane. Some of the spans can also be built as one unit thus eliminating the need for field epoxy.

Steel Trestles

Now let's look at the steel trestle. Design of the steel trestle can, and is much more flexible. It can be comprised of several shallow beams or rails for very short spans, such as 13 or 14 feet in length, or it may be the more conventional beam sizes for spans in the 20-, 30- or 40-foot range. These spans are also made with several different configurations depending on the type of deck employed. An open deck span may have two heavier wide flange beams with cross diaphragms, or four lighter beams under each track. The ballast deck span may have four or five wide flange beams per track. Generally a steel trestle consists of steel piling, steel caps, steel spans, and steel plate floors if it is a ballast deck. One railroad I contacted used a welded thru plate girder for their standard steel trestle.

Some of the details of the steel trestles are as follows: The trestle bents are constructed from several types of piling and caps. The piling can be rolled H-piles, heavier column sections, or pipe piling. The caps may be stiffened H-piles, stiffened heavier beams or channels with cover plates across the top of the piles, or concrete as seen here. The beams vary in quantity, size, and weight depending on the span length and configuration. The floor plates vary in thickness and hold-down devices. There is so much flexibility that an individual railroad should establish its own criteria for a permanent trestle.

Let us now look at several different types of bridges, and note some of their unique differences. First, we will start with concrete trestles. Here is one railroad's concrete trestle which uses 24-inch piling. They only open that portion of the existing bridge where the new piling will be driven. These next slides show the driving of the piles, the forming of the bulkhead, the setting of the girders, and the completed bridge without its track in place. Here is the final bridge. This type of bridge can also be set on two drilled shafts or five 14-inch piling. The caps are either poured-in-place or precast, set on piles, and then attached.

Let us now view a few slides using the box girder approach. In this slide you can see that five girders were used per track in the concrete trestle approaches to a steel deck plate girder which had a concrete deck on it. The piers had 14-24-inch piles with concrete collars, while the bents consisted of 4-24-inch piles. In this specific bridge the joints were all filled and the deck waterproofed.

Concrete Bridge

Steel Bridge

Now we shall look at some steel trestle slides. This first group of slides is for a project in which I was directly involved. Our railroad had designed a steel trestle which employed the principle of simple repetition in its construction. We employed spans having an incremental length of approximately 6 feet-6 inches and ranged from 19 feet-6 inches to 45 feet - 6 inches. This incremental length was used because it is one-half of our 13-foot standard timber trestle. The spans are generally 33-inch wide flange beams with a steel plate ballast deck floor system. The floor plates are also 6-foot-6-inches long so they will cover any variety of span length employed. The beams rest on steel caps which consist of stiffened H-piles and a "T" shape which was an H-pile cut through the center of the web. The "T" portion is set on four HP14X73 piles that have been notched for the web of the "T" and then welded in the field. The stiffened H-pile cap is bolted to the "T" and the span bolted to the cap. The beam, cap, stiffeners, and pile spacing are all 2 feet-9 inches on centers, therefore, presenting a near axial loading condition. The bents are braced in a similar fashion as a standard timber trestle. The bulkhead is made of 5-TS12X6 galvanized steel tubes. This steel trestle utilizes 25-foot spans of steel bents and the 32-foot-6-inch and larger spans rest on 8 H-pile piers which have a poured-in-place concrete cap. These next slides are from the project in which we replaced 36 bridges with our steel trestle and filled 5 bridges.

This bridge is 169 feet in length and approximately 41 feet at its maximum height. There is a rock line about 3 feet below ground at the point of maximum height. The 8-pile piers support a 36-foot span, and a 26-foot spans on steel bents were used in the approaches. The longitudinal and tower bracing is the same HP14X73 piling and are connected to the bents for longitudinal stability.

A large majority of the existing bridges were over county roads. We, therefore, utilized a typical 85-foot bridge which consisted of a 32-foot-6-inch main span and a 26-foot approach span on either side. These next slides show the temporary bridge used when the existing was lengthened, the pile templates, and the pile being driven (you will note that the pile driver is driving one pile, while a truck crane is bringing the next pile to the location). The form for a concrete pier is seen in this slide, and here is a slide of the final bridge. These next few slides show details such as the floor plate hold-down devices, the notch in the bulkhead piles before the "T" is inserted, and a typical bent with the "T" and cap already installed.

There were cases where the standard steel trestle did not lend itself well, but with a few modifications we had very little trouble following the basic design. One example, where a modification had to be employed, would be for a skewed crossing. This was easily handled by skewing the main span. Each adjacent span was skewed at one end and squared off at the other end. The floor plates were designed following the general criteria for the standard 6-foot-6-inch floor plate but was lengthened over the skewed piers, therefore, employing only two modified floor plates. The remaining portion of the bridge used standard 6-foot-6-inch floor plates. The bulkheads and standard steel bents would be employed, thereby conforming to the standard steel trestle. We also shortened bridges by employing culverts through some bents which would handle road or other drainage instead of lengthening the bridge. After three years of construction and near the end of the project, our gangs could build two 85-foot bridges concurrently in approximately four months.

Here is the reconstruction of an existing 104' BDT where a different railroad employed their standard steel trestle. This bridge consists of 4 spans totaling 128 feet in overall length and resting on 2 abutments and 3 intermediate steel pile bents. Here are slides showing the pile driving, the abutment, and bent piles. Notice the rail supports over the excavated area. The caps appear to be stiffened steel piles, welded to the piles with bearing plates on top. Here the frozen ballast is removed, then the deck and stringers. The new steel spans are being placed with the ties already installed. Here is the bridge completed except for the timber bent removal.

This next renewal is the elimination of a

framed open deck bridge in a national forest. Built on rock it needed quite a lot of maintenance. The forest service said the railroad must maintain a structure for equestrians and off-road vehicles. The structure installed was a multi-plate arch and allowed the railroad to eliminate the bridge. Here are a few slides of the existing bridge, the arch during installation, and the final arch with new fill material. Here is another railroad which utilizes the use of a pipe to eliminate an older ballast deck timber bridge.

Another railroad utilizes their standard steel trestle in many ways. Here are some slides showing the use of H-pile bents with two main beams for their open deck trestle and also using pipe piles in many different groupings, 4-pile bents, 8-pile piers, and combinations of bents and piers. The next group of slides shows how they remove an old portion of the existing ballast deck bridge. Here are the final open deck bridge and ballast deck bridge.

Now for a few slides which show the installation of a prestressed 62-foot 13-ton concrete span used by one railroad and the piece of equipment they had designed to handle this type of span. The first of these slides shows that the span has been raised from a flat car, and men are now installing safety beams. Here the span has been raised to allow 4.5 to 5 feet of working room for the trackmen to remove the rail and other track material. The rail is then unbolted and pulled back, so the B&B forces can remove the ties, stringers, and tops of the bents. The span is then raised an inch or so to remove the safety beam, and the 62-foot prestressed concrete span is then lowered into place. After the span is in place the track crane removes each gantry crane and places them in the clear in readiness for the next days progress. Usually one span at a time is installed and requires approximately six hours.

As a final group of permanent structures, let us now look at some composite bridges. These next slides show one railroad's standard thru plate girders on steel pile concrete cap bents with concrete abutment backwalls. Another railroad utilizes steel spans from abandoned lines to develop a permanent bridge as this one. This bridge has a concrete headwall, a 53-foot thru plate girder on a concrete pier with a 27-foot beam span for the other end of the bridge. These composite bridges may be any combination of steel and concrete and still become a railroad's standard permanent trestle.

The permanent trestle is the bridge we all need in the future. They will be the mainstay of our Bridge Departments. They will be used where we must have a way to cross small creeks or county roads. They are not the large major bridges which cross our navigable rivers or interstate highway system. The permanent trestle will be and probably is, the "silent majority."

President Budzileni: Thank you, Don, for a fine report.

Please note, there are copies of all Bridge and Building reports given on the back table of the room and there is no charge! We have now reached the point where, if there are no special announcements, we will adjourn. Be sure to meet with your friends tonight and enjoy the reception sponsored by REMSA. This meeting is adjourned until the Joint Session at 8:30 a.m. tomorrow morning in the Red Lacquer Room.

Meeting adjourned.

WEDNESDAY MORNING

September 26, 1984

The Wednesday Morning Joint Session was called to order at 8:30 a.m.

President Meek: Ladies and gentlemen, we will now call this final Session to order. Our thanks to REMSA for the wonderful reception last night. Many people remarked that it was the best they've ever attended. The final figures regarding registration was 206 Roadmasters; 101 B&B; 212 Associates; and 77 Guests for a total of 596, there were also 77 ladies for a grand total of 673.

I have something I would like to take time to read, it's entitled "Advantages of Belonging to the Roadmasters' Association," this is just part of it but, "...it gives every member three distinct opportunities that are valuable to him personally and, through him, to his company. First, through committee work and discussions he is given the opportunity to develop his reputation for knowledge and ability, a reputation that is valuable to anyone; second, through contact with a large number of men in the same line of endeavor he has the opportunity to acquire new knowledge and new ideas, which he can put to work for himself and his company; third, through Committee and Association work he is given the opportunity to develop those qualities of leadership so essential to success. The value of these opportunities, which is so apparent, is the explanation for the early beginning of the Roadmasters' Association, and its long and successful history."

I would now like to have Mr. Snyder, Mr. Marlow, Mr. Mitchell and Mr. Webb join me on the dias. Max is probably out counting the money! Mr. Snyder, it gives me great pleasure to present this appreciation plaque to you. I'll read it, it says, "Appreciation Award...presented by the Roadmasters' and Maintenance of Way Association of America to R.E. Snyder for his services as Director 1980 to 1984." And Ray, I've certainly enjoyed working with you during that time.

Mr. Snyder: Thank you, Huburt.

President Meek: Mr. Marlow. It is with pleasure that I present this to Mr. Marlow, it reads the same, "Presented to M.J. Marlow for his services as Director 1980 to 1984." Thank you, Mike.

Mr. Marlow: Thank you, Huburt. It's been a pleasure working with you these last few years. We'll miss you.

President Meek: At this time I'd like to turn the rostrum over to President Budzileni. One more thing, we still have not received many special subject cards at the desk. Please take them home, and share with your fellow workers, and mail them to the office, so that we can choose our subjects for next year's conference.

President Budzileni: I don't know, Huburt, every time I have something to say, you beat me to it! And I'm just left standing here saying, "hello." I just want to welcome everyone and I hope you enjoyed last night's reception. Bernice and I did, and we'd like to hear your comments. thank you, Mr. Meek, it's all yours again.

President Meek: I would like to now call on Mr. Don Bessey to introduce the next special feature.

Mr. Bessey: The next special feature this morning is entitled Oil in Groundwater — An Industry's Analyses and Remedial Action to be presented by Robert E. Fronczak, Director of Environmental Control with the Milwaukee Road.

Mr. Fronczak received his Civil Engineering Degree from Valparaiso University in 1974, and shortly after graduation joined the consulting engineering firm of Howard, Needles, Tammen and Bergendoff in Indianapolis and Chicago. Mr. Fronczak joined the Milwaukee Road in 1979 as an Environmental Engineer and was promoted to Director of Environmental Control in 1981. He is presently completing his Master's Degree in Business Administration at DePaul University. Bob is an active member of the AREA Environmental Committee and holds a Professional Engineer's License in Illinois and Iowa. Mr. Fronczak.

Oil in Groundwater
An Industry's Analysis and Remedial Action

by **Robert C. Fronczak**

Director of Environmental Control
Milwaukee Road

Introduction

The Mid-East may have the largest supplies of oil in the world, but the problem with their supplies is the costly processing facilities required to convert the crude oil to useable forms. The Milwaukee Road has found a unique source of oil that should have oil producers drooling. It has found a way to run its locomotives from water wells. To top that, the railroad made some to the local residents ecstatic by supplying home heating oil for them. Unfortunately, not all residents appreciated the railroad's contribution to the local community.

This particular case history involves a location where, for years, it was rumored that a local resident heated his home with oil collected from a shallow well. In early 1979, a resident began complaining of oil seeping into his dirt floor basement. After the involvement of a state senator, the city council, the county planning department, and the local newspaper, the state environmental protection agency initiated a study of the area. Based upon the information obtained, the state established a dollar penalty and ordered the initiation of cleanup efforts.

These efforts have led to the expenditure of a few hundred thousand dollars, and the recovery of over 400,000 gallons of diesel fuel. The paper describes the techniques used by the railroad to determine the extent, thickness, direction, and velocity of the spilled product, the methods used in recovery of the spilled product, and some problems encountered along the way.

In this case, the spilled product is Number 2 diesel fuel from diesel locomotive fueling facilities at a major rail terminal. The spillage is a combination of sloppy locomotive fueling procedures and the repetitive failure of underground fuel lines totalling more than 700 feet. The first lesson to be learned from an incident of this nature is that leaks should be prevented. Periodic pressure tests of underground lines were made at this facility. No action was taken based upon the results of these tests however. It is imperative that fuel lines be repaired if leaks are suspected. It is often easy to blame the leaks on bad valves. This can be a costly mistake however.

Determination of Fuel Extent, Thickness, Direction and Velocity

To determine the extent of the contaminated area, a series of sandpoints were driven both on and off company property. These sandpoints consisted of four-inch diamter steel piping recovered from retired facilities at the site. Vertical overlapping torch cut slots were cut into the pipe with a minimum of three-foot perforation above and below the water table. This allows for accurate measurement of the oil layer using water finding paste and provides allowance for fluctuation in the water table during wet or dry periods. The sandpoints were locked to prevent vandalism. Certain sandpoints were protected from traffic with wooden posts.

Locations of the sandpoints were determined in part by the information provided by a local well driller who had experience for a period of 30 to 40 years in this particular area. The time that the sandpoints were driven was an extremely dry period; however, information from the local well driller and county planning indicated that the water table had a fairly constant level. The conclusion was that the river one-half mile distant minimized the fluctuations in the groundwater in the direction of the river.

As estimate of the groundwater velocity was obtained using the equation:

$$V = \frac{Kf\ i}{Ne}$$

When: V = average linear groundwater velocity
KF = soil permeability to fuel
i = hydraulic gradient
Ne = effective porosity

The total porosity of the soil is defined as the ratio between the total volume of voids to the total volume of soil. It was determined to be between 0.30 and 0.38, based on standard penetration test density estimations and soil gradation. The effective porosity is the ratio of the volume of the voids that are capable of transmitting fluid to the total soil volume. The effective porosity, therefore, excludes bound water and tightly held water. To account for bound and tightly held water, the effective porosity was estimated to be approximately 0.20 based on pumping tests.

The soil permeability was first calculated for the aquifer based on the flow of water. Utilizing published viscosity values for water at typical groundwater temperatures (absolute viscosity = 1.3 centipoise [cp]), the permeability of the soil to water was converted to the intrinsic permeability of the soil, as calculated by the equation:

$$k = \frac{Kpg}{u}$$

Where: k = soil permeability to fluid
K = intrinsic permeability
p = density
u = absolute viscosity

The intrinsic permeability was then converted to the permeability of the soil to fuel utilizing published values of viscosity and density for No. 2 diesel fuel (absolute viscosity = 2.3 cp, specific gravity = 0.89). The permeability of the soil to fuel was determined to be approximately 2 times smaller than that to water.

The results of the evaluation of the plume velocity are presented below. The velocity of the plume was calculated based on the soil permeability to fuel, the long-term effective porosity, and the maximum, minimum, and average hydraulic gradient of the water table measured at the site. The velocity of the plume was also calculated based on the average hydraulic gradient measured regionally. These velocities have been calculated neglecting interferences due to pumping and recharge. If the plume is unabated, it is estimated that the more mobile portions of the plume (greater than 0.3 ft. thick) may reach the slough in approximately 10 years. The plume velocity was estimated as follows:

Hydraulic Gradient (ft./ft.)	Effective Porosity ($ft.^3/ft.^3$)	Soil Permeability to Fuel Oil (cm/s)	Plume Velocity (ft./yr.)
0.0059 max.	0.20	$2.4 \times 10\text{-}3$	75
0.0012 min.	0.20	$2.4 \times 10\text{-}3$	15
0.0024 avg.	0.20	$2.4 \times 10\text{-}3$	30
0.0033*	0.20	$2.4 \times 10\text{-}3$	40

*This gradient represents the average regional gradient for this aquifer.

It was determined that two recovery wells would be installed to assess the performance and recovery rates of two floating surface skimmers and the efforts to drawdown the water table. Soil conditions encountered at the water table, approximately ten feet below grade, caused the soil to cave in to the excavation making placement of the two foot diameter recovery well difficult. This is particularly important in that sufficient depth was not achieved to properly submerge a groundwater depression pump. It was also realized that the operation of the depression pump could not proceed due to the fluid nature of the soil. In an extremely short trial run, the suction of the depression pump became plugged with the larger soil particles.

The greatest benefit of this installation was the accumulation of engineering data necessary to design a much more effective installation and eliminate many of the problems that had been encountered.

It was determined that an improved recovery system would be installed along the north property line. The recovery system was installed within the spill area, and no attempt was made to intercept the leading edge of the spill. Basically the improved system involved four recovery wells spaced at 400-foot center-to-center intervals. A

trench was dug between the recovery wells and backfilled with three feet of gravel, 1.5 feet below and 1.5 feet above the water table. The trench was then backfilled and leveled. The trench provided a conduit to channel oil into the recovery wells and was designed to accommodate a drop or rise of the water table. It must be noted that the trench did not stop the oil from continuing to move in the direction of groundwater flow. The establishment of a cone of depression at the recovery wells will prohibit the movement of oil across the trench and channel such flows into the recovery wells. The spacing of the recovery well was based on the size of the depression cone that was anticipated (200-foot radius). Typically the downstream side of the trench would have been lined with a plastic sheet to prevent the movement of oil downstream *if* the trench system had been constructed at the leading edge of the spill.

Construction of the improved recovery well system included a five-foot diameter, ten-foot long corrugated steel pipe with vertical torch cut slots. Using a larger backhoe, an excavation was opened and the five-foot diameter pipe placed. Emphasis was upon achieving a level five feet below the water table. If this could not be achieved with the backhoe, the casing was mucked by hand. It should be noted, the total depth of these wells is approximately 13 feet. Drilling should be considered for wells deeper than this depending on site conditions.

A three-foot diameter 20-foot long corrugated steel pipe with torch cut slots and steel bottom was installed within the five-foot diameter casing. The space between the casings was backfilled with gravel pack to act as a filter preventing the plugging of the submersible pumps.

Typically there are two ways to remove oil from the groundwater; i.e., using a one or two-pump system. In this case, the most cost effective means of depressing the groundwater table and recovering the oil involved the use of standard industrial duty sump pumps installed within the recovery well. Oil and depression waters are discharged into a common force main connecting the recovery wells.

The two-pump system utilizes a pump to lower the water table inducing the oil to flow into a well. Another pump either floats or is suspended on the surface of the well, pumping the oil product to the surface separately. Oil pumps are available with filters (hydrophobic/oleophillic) which will only allow oil to pass through and no water. When an oil sump on the skimmer fills with filtered oil, it is pumped to the surface. The advantage of the two-pump system over the one-pump system are twofold. First, the two-pump system does not tend to emulsify the oil water mixture by pumping. The resulting water is free from oil and is easily disposed. Secondly, it eliminates the need for a secondary treatment system.

The force main discharges into the basement of an abandoned building which has been modified to act as an oil separator. The capacity of the building basement is 200,000 gallons. Discharge from the separator is a seepage field which was constructed to accept the discharge from the depression pumps. This disposal method was employed due to the state's requirements that any surface water discharge contain zero oil and grease.

The oil is skimmed from the surface of the oil house separator using a floating skimmer. The oil is pumped to temporary holding tanks on the oil house dock. When the tanks on the dock are filled, the oil is filtered, using a standard locomotive fuel filter, into the now abandoned diesel fuel tanks. Prior to the abandonment of the facility, this fuel was held in tank cars. Samples were sent to the Railroad's Test Department for analysis. Analysis determined that the fuel met the Railroad's new fuel specifications. This recovered oil was blended in with new diesel fuel and used on locomotives as new fuel. Over 300,000 gallons of fuel was disposed in this manner. Recovery rates of up to 30,000 gallons per month were experienced during maximum removal.

Stage Two Cleanup

The second stage of the cleanup operations began at the beginning of this month after protracted negotiations with the State Environmental Agency led to a settlement of the pending law suit. A Consent Decree, Judgement and Order, and accompanying Supplemental Compliance Plan was signed

by the Railroad in February 1984.

The Supplemental Compliance Plan calls for the installation of additional underground gravel trenches and recovery wells and associated piping. Once again 30-inch diameter corrugated metal pipe was used for the recovery wells. This time, however, a rail saw was utilized for the installation of the vertical well slots. This procedure reduced the amount of time to cut the slots and made a more uniform slot size.

It was fortunate in this case that the area north of the railroad's property was owned by the city. The city uses the property as a storage area for street maintenance materials. There was no problem getting permission from the city to install the expanded recovery system.

In addition, a trench and recovery well were installed at the leading edge of the spill. An abandoned storm sewer, previously used by the railroad, was utilized to install the pump discharge line back to the oil separator. This prevented having to trench in the middle of a city street.

The new system called for the addition of 16 new recovery wells and 2,200 feet of underground gravel trench. The new system also utilized the old recovery wells for recharge. Since recovery rates in the existing system have dropped to approximately 2,000 gallons per month in the past two years, it was decided to reverse the flow in the old system. This would provide the following advantages:

1. It would increase the gradient between the new wells to allow for more rapid removal of the oil.
2. It would provide an easily accessible disposal point for water discharged from the oil separator.
3. It would not require additional piping. The flow will be reversed in the present system feeding the oil house.

The new system also employs two small four-inch diameter wells in the railroad's old transfer table area. This transfer table is presently being used by a firm that purchased the facility to do rail car maintenance. Two small wells were installed in lieu of one large diameter well and a trench to minimize the business disruption to the new owner. It should be noted that a right to perform activities required to recover the oil was reserved in the sale agreement to the new owner.

The supplemental compliance plan calls for the removal of the fuel to a level of 0.3 feet as measured in the monitoring wells, or to a level of 10 mg/1 as determined from water being pumped from the recovery wells. The 0.3 feet criteria was based upon a literature search indicating that fuel depths in recovery wells do not represent a true picture of the action of fuel in the ground. Actual fuel depth approaches 25 percent of the measured oil in the monitoring well. In addition, when recovery reaches this level, the remaining fuel would have low mobility and be retained in the soil for long periods of time. Finally, it is anticipated that at this depth of fuel, water removed from the aquifer would be able to meet the tentative Water Quality Board standards for allowable oil in water being used for irrigation.

These levels will have to be maintained for a period of ten quarters. If levels cannot be maintained, pumping will have to be reinstated. Monitoring will then be required for an additional five quarters after acceptable levels are reinstated.

Problems

Due to the relatively fine soil characteristics and the course gravel and well screens used on the system, a sludge problem was developed at the oil house separator. The sludge attached itself to the oil and resulted in a floating sludge on the separator. This floating sludge caused the oil skimmer to plug.

To solve these problems, a floating skimmer was purchased to skim the sludge to an unlined sludge holding pond adjacent to the separator. As much oil as possible is pumped off the surface of the pond. Using the oil skimmer, then the pond is allowed to drain back into the contaminated aquifer. Note that the location of the pond is just upstream from the recovery well and trench system to allow for recovery of any lost product. After the sludge dries, a backhoe is used to remove the sludge for land farming on the site.

When initiating the Phase 2 recovery effort, it was originally thought that a two-pump recovery system would be used. This system would have utilized fine well screens

and gravel pack to prevent the entrance of the silty material into the wells. Because of the remote location of the facility and extreme winters, however, it was decided to stay with the one-pump system. In this instance, the one-pump system offers the following advantages:

1. Plugged well screens would be a maintenance problem due to the site's remote location. It would have caused maintenance of each individual well on a periodic basis where such expertise is not readily available.
2. The two-pump system would require the maintenance of relatively sensitive oil scavengers at each well. The maintenance problems are amplified in cold weather since these systems must be maintained well above freezing.
3. Due to the high capital cost of such equipment, the railroad would have purchased only four or five units which would have had to have been moved from well to well. This would require moving portable oil storage tanks, further aggrevating maintenance. By having all the oil recovery operations in one building, the railroad minimizes capital costs and maintenance problems.
4. The sludge problem is something that can be dealt with. By having the one-pump system it can all be done in one location, out of the weather.
5. The problem of disposal of water was overcome by using existing wells to recycle the water. The disposal of slightly contaminated water was not a problem in this case therefore.

Conclusion

To date, over 408,000 gallons of fuel have been recovered at the site. By applying the present cost of diesel fuel to the product, the value of the recovered fuel does much to pay for the cost to recover it. The value of the oil has decreased since the railroad ceased operations at this site. The railroad can no longer obtain full value for the fuel by using it on locomotives. Presently, the oil is being sold to a scavenger for reuse.

The literature indicates that this recovery operation is among one of the largest land based oil spills in the United States. The recovery rates obtained at the location compare favorably to those obtained at larger spills.

Finally, it would be well to reiterate a statement made by Julian Josephson in January 1980 *Environmental Science & Technology* article entitled "Safeguard for Groundwater." "Because contaminated groundwater is exceedingly difficult, if not impossible, to clean up after the fact, the most expedient approach to groundwater protection is to prevent contaminants from reaching it in the first place." It should be everyone's job to see to it that their companies are adequately protected from occurrences of this nature. Personnel found to be responsible for these occurrences may find the problems of the Mideast oil barons small in comparison. Thank you. Are there any questions?

Member: Mr. Fronczak, roughly what would a two-pump system cost per unit? In other words, if you were just going to make up the pump system.

Mr. Fronczak: Well, just the equipment itself is probably $11,000, and all the other equipment would be pretty much the same. Now that's another $1,000 per well, rather than say $5,000 per well.

Member: Will you ever get it all out?

Mr. Fronczak: The literature, basically, predicts that 50% of oil spills in groundwater will not be recoverable, though we expect to get at least 50% out of it. If we've gotten 400,000 gallons out already, that means there are still at least 800,000 gallons, and we expect to get a lot more.

Member: Are you going to get rid of the EPA with 50%?

Mr. Fronczak: I feel that we will, because we feel that what's left will be relatively low, and we'll be able to meet our three-foot cutoff.

Member: After several years, what is the depth now?

Mr. Fronczak: We've gone from about 2.8 foot down to less than a foot. We expect the final recovery to take about three years.

President Meek: If there are no more questions I'll thank Mr. Fronczak for a very good report. I'd like to call on Mr. Marlow to present the next feature.

Mr. Marlow: Thank you, Huburt. Our next feature this morning is called Field Communications for Maintenance of Way. Presenting this program will be Herb Massie, who is superintendent of communications for the Santa Fe, headquartered here in Chicago. Mr. Massie is a native of Amarillo, Texas. Herb's communications career began in high school when he first obtained his Federal Communications Commission Commercial Radio License and continued during his tour of duty in the U.S. Army and attendance at West Texas State College. He began his Santa Fe communications department career at Amarillo in 1948, coincidental with the system-wide expansion of radio and microwave communications facilities. His "temporary' transfer to Chicago in 1956 now seems permanent after 28 years, during which he has held many engineering and management positions leading to his present position of general superintendent of communications.

Herb has long been active in the AAR's Communications and Signal Division, where he is currently serving as Chairman of the Division, Chairman of its Communications Liaison Committee, and Subcommittee Chairman of the Special Track/Train Dynamics Committee developing Train Information Systems. Herb served on railroad Ad Hoc committees dealing with remote controlled locomotive systems and automatic car identification systems and has been involved in the AAR's efforts in Geneva to prevent loss of Railroad Radio Spectrum to International Maritime interests. Mr. Massie.

Field Communications

by H.L. Massie

Superintendent of Communications
Atchison, Topeka and Santa Fe Railway

Outside of the military, I know of no other operational requirements for the variation of field communications that might exceed that of the railroads. Like the military, railroads have very high fixed costs and facilities, equipment and manpower. The important variables we have to work with are time and volume. The quicker we get the job safely done, the less it costs, and the more time we have for other jobs. This translates into efficiency of operations which is largely dependent on proper coordination of people, facilities, equipment and service. Good operational coordination requires many various types of good communications to minimize (one hopes eliminate) the coordination errors that lead to loss of safety and efficiency.

While we certainly don't stand alone or necessarily above others in field communications, I am very proud of what Santa Fe has done toward providing good, reliable and essential communications to support a safe and efficiently coordinated environment for our field employees to work in.

As with your specific area of responsibility, none of this would be possible without top management and budgetary support. On the Santa Fe, we enjoy this support. This places a responsibility upon the communicators to listen to what you as the user has to say concerning your needs. A communcations system devised to satisfy the communicator probably would be useless to the user. We consider the user as our "customer." If the customer won't buy our product, he improvises or goes elsewhere if he can.

Now, on a more practical note, what have we done to respond to the user's expressed field communications requirements?

Existing Systems

For all practical purposes, we have eliminated our dependence on pole line facilities for deriving our communications circuits. Now this is one of those "good new — bad news" situations. The good news is it has eliminated problems associated with brush control. The bad news is we no longer have the continuously available communications circuits and booth phones along the right of way.

To supplant the pole line facilities, we have provided over 10,000 mobile radios and approximately 600 radio base stations forming three separate major system-wide radio operations.

- Direct dial radio mobile telephone access to our system-wide telephone network, known as the Mobile PBX Access System.
- Direct radio access to Division Operations Centers and Engineering Department offices, known as our Right-Of-Way or Maintenance System.
- Direct radio access to Division Operations Centers, dispatchers, and others known as our Road or Train System.

Supplementing these major radio systems are some of the specialized radio operations I will discuss in greater detail.

Ideally, from a simple coordination standpoint, all of the operations would be on the same radio channel. However, because of the large number of radio users, the possibility the various operations will be in the same area, and the need to have channel access for safety and efficiency reasons, all of these systems use one or more different channels to control undesired system interference and congestion. Utilizing these various channels "isolates" the various users. Therefore, in addition to using multiple channel radios to permit direct mobile unit access to other systems or operations, we needed a way to interconnect one system user with another system user. To solve this problem and at the same time enhance field communications capabilities, we are currently installing, on a progressive basis, local computer based communications circuit switching equipment. This equipment coupled with positions of communications coordinator, train dispatchers and others to communicate with and/or interconnect any user with another user regardless of their location within our communication system. For example, a machine operator or gang foreman "on track" at Cadiz, California, could talk directly to the centralized work equipment shops in Albuquerque to discuss machine problems or secure repair parts, or if necessary, talk to the assistant general manager - engineering. Any of this staff in Chicago have telephone access to anyone who is equipped with a mobile radio installation. In short, this concept has unlimited possibilities of combinations of coordinations through flexible communications.

Supplementing these large systems are the specialized isolated radio operations such as:

- Rail loading
- Rail welding plants
- Rail unloading
- Tie plant
- Centralized work equipment shops
- Track gangs
- Survey parties
- Hump yard maintenance
- Signal system maintenance
- Police or Special Service

Rail Loading Operations

Because of the intense need for absolute safe coordination, all of the radio units provided for the locomotive engineer, rail powercar operator, pointman, foreman, and roadmaster are on a dedicated channel to prevent interference into or from other systems. These radio units provide voice communications for coordination purposes. They are also provided with an emergency push button to transmit a tone coded signal that will directly cause an immediate emergency brake application to the train, as well as the necessary valves to unload the hydraulic systems that move the rail. As a further safety feature, this emergency activation also generates high level audio tones in all of the operations radio units. This immediately notifies everyone an emergency situation exists. After the emergency, the locomotive engineer clears the emergency brake application and the rail power car operator resets the hydraulic loading system. To provide on-going tests

of the radio emergency control system, the foreman uses his radio unit to stop the train each time the train must remain stationary for any reason.

Rail Welding Plant

The radio control system for this operation is very similar to the rail loading operation, except there are no locomotives involved. This system is used to provide voice communications to coordinate the various functions, and it also has an emergency tone generating system with which to alert operations personnel and at the same time automatically disable the hydraulic rail movement system. In this operation, the system is checked at the beginning of each shift and at other times with the pointmen utilizing their hand-held radios to stop the system.

Rail Unloading

The communications involved in rail unloading operations are carried out on a separate channel with a group of two-channel hand-held radio units capable of operating on the road or train frequency to communicate with trains or dispatchers with the communications relating to the unloading process on its own isolated channel, so as not to interfere with train or other nearby operations.

Tie Plant

Our tie plant in Somerville, Texas is also an operation requiring a dedicated radio channel. The plant is equipped with two radio base stations, one to coordinate the activities of the tie plant and the other to coordinate train operations associated with the logistics moving material and ties in and out of the plant. There are also two fire trucks assigned to this plant that are used in the event of plant or right-of-way fires, as well as being available for mutual aid to the surrounding communities. In addition to the plant channel and the train radio channel, the fire trucks are also equipped with Citizen Band radios, primarily for coordination with the local community fire departments.

Centralized Work Equipment Shops

The Centralized Work Equipment Shops communications requirements have been provided by means of two-frequency repeater base stations equipped with multiple control points for office personnel and hand-held radio units as well as mobile radios, forklifts, and other shop equipment and vehicles. Each hand-held radio can be individually "paged" or "selected" from base station control points. An advantage of repeater operations is that it allows direct

mobile to mobile radio communications throughout the various shop building locations and the city.

Track Gangs

On the Santa Fe, we have standardized on a pool of General Electric portamobile units for equipping our maintenance-of-way equipment as well as providing the foreman with radio communications for track gang coordinations and communications with the trains and dispatchers. This pool of radio units is under the control of the System Engineering Department to assure maximum efficiency of utilization. While this unit is larger and heavier than the

more common smaller hand-held units, it has sufficient transmitter power to provide an extended range and better coverage reliability to insure communications with approaching trains and our dispatchers controlled base stations.

This unit has sufficient audio power and the capabilities of being used as a public address system, better known as a "bullhorn." The unit has the capabiltiy of having its internal battery charged from a track machine or a portable AC charger. Since the Engineering Department maintains the assignment inventory, we do not require radios to be installed on every piece of maintenance of way equipment.

Hump Yard Maintenance

In the building of new hump yards, or the modernization of hump yards, along with their on-going maintenance, we have provided a separate yard "maintenance" or "utility" channel used by the Engineering, Shop extension, B and B, Signal, and Communications Departments to coordinate the many maintenance activities required to keep these yards in good operating condition.

Signal System Maintenance

The Signal Department is provided with vehicular radios and in some instances, the GE portamobile unit that can be removed from the vehicle and carried to the Signal House so they can be contacted by radio at all times. The Signal Department is also a big user of the PBX mobile access, both for its repeater capability and telephone network access. Availability of the maintenance of way channel permits hand-held units to coordinate signal system maintenance without interfering with train operation.

Police or Special Service Operation

Many of the railroads, including the Santa Fe, have made available to this department a separate dedicated channel to aid in providing the secure radio communications necessary to coordinate stake outs and other sensitive operations. We have also equipped their vehicles with multiple radio system units to provide mutual aid with City, County, State and Governmental law enforcement agencies.

While data communications has not significantly become a part of field communications as we are addressing here today, the technology and equipment is currently available. As I see it, this facet of field communications will, in the future become widespread. Presently, it is largely resource constrained, i.e. monetary resources and

system development resources. There are several more interesting high technology based systems that most assuredly will play a role in field communications. The one most likely to emerge first will be nationwide cellular mobile telephone networks. The FCC is considering a satellite based mobile radio system known as "Mobilsat" and has taken recent action to consider the need and benefits of a multiple satellite based radio determination system known as "Geostar." This radio location system would expect to have an accuracy of ±3 meters or approximately 10 feet. This sytem would also have the capability of conveying data messages or information of 32 characters in length.

In closing, I want to emphasize that none of what I have described could have been accomplished in a vacuum. It is the product of people exchanging ideas and information with our management, our users and, just as important, those of you from other railroads and the suppliers.

Great ideas are made up of good small ideas using communications and coordination to intelligently put them together.

Thank you.

Mr. Marlow: Thank you, Mr. Massie for a very informative presentation.

President Meek: I'll now call on Don Bessey to make the next presentation.

TRACK 125

Mr. Bessey: The final feature of the 1984 Conference is entitled Track 125. This is a film presentation by British Rail, which I received from Mr. D.S. Curry, who is Deputy Director of Civil Engineers, British Rail in London and with the greatly appreciated assistance from Mr. Joe Neuhofer of Plasser American Corporation.

The film, which I am sure will be of great interest to everyone, describes the construction of a modern railroad track, and it takes it from start to finish from the manufacture of the rail and fasteners, the manufacture of concrete ties (or should I say stringers) and renewal of the track to accommodate 125 mph passenger train operation.

(Whereupon there was a film presentation.)

President Meek: That was a very fine film presentation, Mr. Bessey. I'd like to turn the rostrum over to Mr. Budzileni at this time.

President Budzileni: Thank you, Mr. Meek. At this time I will call on the chairman of the Resolutions Committee, Mr. John Kapp.

Report of Resolutions Committee

Mr. Kapp: Having reached the closing of the annual joint conference of the American Railway Bridge and Building Association and the Roadmasters' and Maintenance of Way Association of America, and being deeply indebted to all those members and friends who have contributed their time and efforts to make our conference a success, it is right that we should acknowledge this indebtedness and that it shall be so entered into the minutes of this meeting.

Therefore, be it resolved that our heartfelt thanks be extended to Pastor Earl Ferguson, Deer Creek Christian Church, who at the opening of our conference invoked upon our deliberations the favor and guidance of Almighty God.

Be it further resolved, that our deep appreciation be extended to those who have honored our Associations with their presence and by their informative addresses:

James E. Martin, President, Illinois Central Gulf Railroad
William M. Gibbons, Consultant, Chicago Pacific Corporation
V.R. Terrill, Vice President-Engineering, Boston & Maine Corporation
Robert Graziano, O.H. Material Company
F.D. Day, Conrail
J.E. Fluet, GeoServices, Inc.
A.H. Nance, Denver & Rio Grande Western Railroad
J. Carney, Chief Railroad Utility Program Board, Federal Highway Administration
Peter Jahn, Project Specialist, Chicago Metallic Corporation
K.P. Felsburg, Jr., Senior Director Engineering Construction, Amtrak
J.S. Otto, Director of Administration, Western Coal Properties, C&NW
Rodger Weibusch, Chief Bridge Branch, U.S. Coast Guard
P.B. McMahan, Manager of Safety Research, Association of American Railroads
H.L. Massie, General Superintendent of Communications, AT&SF
R.E. Fronczak, Director Environmental Control, Milwaukee Road
British Railways
Japanese National Railway

and to all the committee chairmen who, with the loyal cooperation of the committee members prepared the interesting and instructive reports that have been presented.

Be it further resolved that a very special thanks is expressed to Knox Kershaw, President of REMSA, and all all members of the Railway Engineering Maintenance Suppliers Association for the fine reception that we enjoyed Tuesday evening. Our thanks is also expressed to Mrs. Jim Budzileni and Mrs. Huburt Meek and their committee for their efforts in arranging registration and entertainment for our wives. Our thanks also to the management and staff of the Palmer Hosue. We also thank the area railroads who lent assistance to our registration desk during the conference. A special thanks goes to Pat Weissmann and Joyce Grier. Without their unselfish assistance, these two Associations would have great difficulty functioning.

And be it finally resolved that both Associations express their heartfelt thanks to the outgoing presidents, Jim Budzileni and Huburt Meek who have spent so much time and effort in guiding the activities of our Associations with great efficiency and dedication during the past year.

I move these resolutions be adopted.

Respectfully submitted,

J.T. Kapp
Chairman, Resolutions Committee

President Budzileni: Thank you, Mr. Kapp. May I have a second to the motion?

Member: Second.

President Budzileni: All in favor? (Affirmative response.) All opposed? (No response.) The motion is carried and will be so recorded.

As this 89th Conference of the American Railway Bridge and Building Association draws to a close, it has been a very successful one and my term as president also draws to a close. At this time I would like to thank all the people on my team who helped make it a big success. Everyone always says the president does such a good job, but if it weren't for these two Boards that we have here, we wouldn't be anything.

At this time, I'm going to call on two past presidents, Mr. Omar Denz and Mr. Ray Hernandez, to take over this program.

Mr. Denz: The following is the list of officers-elect of the American Railway Bridge and Building Association for the administrative year 1984-1985. The officers so named please step forward and take position on my left.

President — J.M. Williams, Supervisor B&B, Elgin, Joliet and Eastern Railway, Gary, Indiana.

Senior Vice President — D.A. Bessey, Assistant Chief Engineer-Structures, Milwaukee Road, Chicago, Illinois.

Junior Vice President — J.T. Kapp, Projects Manager-Construction, Conrail, Philadelphia, Pennsylvania.

Junior Vice President — D.J. Lewis, Senior Structural Designer, Illinois Central Gulf Railroad, Chicago, Illinois.

Director — J.H. Smith, Buildings Engineer, Illinois Central Gulf Railroad, Chicago, Illinois.

Director — D.W. Brookings, Bridge Engineer, Kansas City Southern, Kansas City, Missouri.

Director — W.P. Cunningham, Utilities Engineer, Missouri Pacific, St. Louis Missouri.

Treasurer — P.H. Saletnik, Engineer Buildings, Chicago and North Western Transportation Company, Chicago, Illinois.

Mr. Hernandez: Good morning. The following is a list of officers-elect of the Roadmasters' and Maintenance of Way Association of America for the administrative year 1984-1985. The officers so named please step forward and take position on my right.

President — D.E. Staplin, Director Planning and Valuation, Seaboard System Railroad, Jacksonville, Florida.

First Vice President — C.W. Moorman, Division Engineer, Southern, Greensboro, North Carolina.

Second Vice President — M.J. Marlow, Supervising Engineer Tracks and Property, Elgin, Joliet and Eastern Railway, Joliet, Illinois.

Treasurer — R.E. Snyder, Assistant Chief Engineer-Maintenance, Chicago and North Western Transportation Company.

Director — A.K. Pottorff, Assistant to Chief Engineer, Atchison, Topeka and Santa Fe Railway Company, Chicago, Illinois.

Director — S.J. Hill, Office Engineer, Soo Line, Minneapolis, Minnesota.

Director — V.P. Mahon, Department Manager Power & Way Maintenance, BART, Oakland, California.

Election to a position of leadership in any organization is an honor not to be taken lightly. Your fellow members, in electing each of you to your respective office, have expressed confidence in you. First, that you are to discharge your several duties with distinction. Second, that you are willing to do so.

Mr. Denz: As the officers of our associations, you will represent to the citizens of this country the true meaning of railway bridge and building, roadway maintenance and construction. You will be our collective voice in the industry. Thus, you will be our common bond with railway personnel throughout the United States and the world.

Mr. Hernandez: As the officers of our associations you will represent our best interests in any of your activities or projects — always reminding yourselves that your attitude must be a part in any undertaking sanctioned by your respective Associations. In this you will be adhering strictly to the constitutions and by-laws of our Associations.

Mr. Denz: It is important that this bond be preserved strong and unblemished. As professional railroaders determined to give an honorable and useful accounting of our

special talents to our respective companies and customers, we must present a united front in our professional endeavors. We must be examples in which people may have confidence that they may learn that they can depend on us in matters involving the economic use of materials and property entrusted to us. Only thus shall we grow and fulfill our destinites.

Mr. Hernandez: Do you now, in the presence of these fellow members of our Associations, pledge yourself faithfully to discharge the duties of the office to which you have been elected? If so, answer, "I will," and please repeat after me: I (state your name) pledge to give cheerfully and willingly of my time and talent and to serve the advancement of my Association with the highest goals of achievement, a steady shining beacon. I make this pledge in humility and the need of divine guidance.

Mr. Denz: Will all members in the audience of both Associations please stand. You have heard the pledge of your officers-elect. Unless they have your wholehearted support, they will not be able to fulfill their pledge, so faithfully given. Do you, therefore, promise to support these, your officers, as they guide their respective Associations through the coming year. You will assist them whenever you are called upon for help in understanding the various activities which they plan. Will you encourage and advise them, and refrain from unjust criticism of their plans and actions? If so, answer "I will." Let these mutual pledges be our constant help to the end that our Associations may be an increasingly greater force for the well being of the railroad industry.

Mr. Hernandez: Will the officers-elect please remain standing, the others may be seated. As a representative of the Roadmasters' Association I install each of you in the office to which you were elected in your Association.

Mr. Denz: As a representative of the Bridge and Building Association I install each of you in the office to which you were elected in your association.

Mr. Hernandez: Congratulations.

(Applause.)

President Budzileni: At this time it is my pleasure to call on Frank Semans, First Vice President of RESMA.

Mr. Semans: Thank you, Jim.

President Budzileni, President Meek, Mr. Williams, Mr. Staplin, members of the Bridge and Building and Roadmasters' Associations, ladies and gentlemen. I regret that our President, Mr. Knox Kershaw, could not be here today, however, it is a distinct pleasure for me as First Vice President of REMSA, to congratulate your Associations on their selection of new officers and members of your boards.

I would certainly be remiss if I did not thank Jim Budzileni and Huburt Meek and all members of their boards, plus Pat Weissmann and Joyce Grier for the excellent cooperation REMSA has received in the past year. We feel certain that this spirit of cooperation will continue. As most of you know, it has been customary at this time each year for REMSA to present the incoming president with a gavel symbolic of authority during the upcoming term of office. Therefore, I would like to present this gavel to Mr. Jim Williams, President-Elect, American Railway Bridge and Bulding Association. Jim, we know that you will use this well.

Mr. Williams: Thank you.

Mr. Semans: It now gives me great pleasure on behalf of REMSA to present this gavel to President-Elect Mr. Dave Staplin, Roadmasters' and Maintenance of Way Association of America. Dave, I know that you too will use it wisely and well.

Mr. Staplin: Thank you.

President Budzileni: I want to call on President-Elect Williams.

President-Elect Williams: Thank you, Jim. Fellow members of the Bridge and Building Association I feel greatly honored being elected President of our Association and will do my best to live up to the high standards of my predecessors. And speaking of predecessors, on behalf of the Association and myself I want to thank Jim for the great job he has done this year and for this conference. I would like to present him with this plaque, which reads "Presented to Jim Budzileni for his service as President of the Association 1983-1984 and Vice President 1981-1983. Jim.

(Applause.)

President Budzileni: Without everyone's help, I couldn't have done it. Thank you.

President-Elect Williams: Jim, thank you from all of us. We will continue to benefit from Jim's experience as he will continue to serve on the Executive Committee this next year. I also want to congratulate our new Junior Vice President, Don Lewis. Don has served well as a director, and I am sure he will continue to do so in his new position. I want to welcome our new directors, Mr. Smith, Mr. Brookings, and Mr. Cunningham. I am positive we'll find plenty to keep them busy. Our next conference will be in Dallas next September, along with REMSA's equipment show. Your participation and reports for the program are needed, and your efforts to provide input and interest in the special subjects will most certainly be appreciated. On behalf of both Associations I would like to express our appreciation to REMSA and to the suppliers for their help and hospitality during this conference. For B&B there will be a short meeting of the Executive Committee right after adjournment. At this time I'll turn the rostrum over to President Meek.

President Meek: First I would like to call upon one of our past presidents who was unable to be here until today. Bill Cruse. Please stand up and be recognized.

(Applause.)

Now I have two other gentlemen I would like to call up. Max Mitchell finally got the money counted and Herb Webb got through with some of his "rushing" needs. Would you two gentlemen please step up here so I can present your plaques to you.

Where's Max Mitchell?

Secretary: He went to the bank.

President Meek: Oh now he's gone to the bank! (Laughter.) By golly, he does a good job. I sure would like to recognize him. But, we'll mail him his plaque. This reads, "Appreciation award presented by the Roadmasters' and Maintenance of Way Association of America to Mr. H.G. Webb for his services as director 1980-1983." Herb, you served well with us.

Mr. Webb: Thank you.

President Meek: I would like now to publicly thank all of the officers and board members of our Association for all assistance they have given me during this past year. I didn't have anything to do, they did all the work. I get all the pleasure. They have done a fine job, and I'm certain the new ones who have been selected will help also. This thing is now beginning to wind down, so we can all go back to work. And some of us will have to go back to where the snow is falling. I talked to someone this morning, and he said there were 18 inches of snow in Wyoming yesterday, which reminds me of a story. They used to run a lot of passenger trains. Passenger train stopped in Cheyenne one day in a raging blizzard. And one lady asked a porter, "Does much snow fall here?" He says "No Ma'm. But there's sure a powerful lot that goes through here!" (Laughter.) So that's the way it is.

Now I would like to take this opportunity to present the President's Pin to Mr. Dave Staplin. And you're now the President.

President-Elect Staplin: Thank you very much, Huburt. Also I would like to thank the members of the Executive Committee of the Roadmasters' Association and membership for this honor. I think it's an especially great honor when you are selected by your peers and I'll certainly attempt to keep the high standards that Huburt and our previous presidents set for us.

I'd like to personally thank two or three folks who had a lot to do with my being up here, I've had the advantage of working for two good railroads, those two railroads have two good chief engineers. One I would like to recognize is Mr. Ben Gordon of Conrail, and my present chief engineer, Russ Frame of Seaboard Systems. And I also want to thank Mr. Earl Richardson, my direct superior on the Seaboard for his support. My wife couldn't be with me here in Chicago. She's got a full time job with our two young girls, 5 and 7 years old, so she doesn't do a lot of traveling. I would like to recognize her also and thank her for her support.

At this time I'd like to present Mr. Huburt Meek with a small token of our appreciation for the things he has done for our organization in the last year and also in previous years with his service on the board and as a director. This reads "Presented by the Roadmasters' and Maintenace of Way Association of America to Huburt V. Meek

for his service as President, 1983-1984," and let me tell you, it's a real honor to give it to a leader like Huburt Meek who certainly sets a high standard in our industry. Huburt.

President Meek: Thank you, Dave.

President-Elect Staplin: We've had a lot of firsts in our organization during the last several years. We've had our first Canadian president, we've had our first Hispanic president. I don't know where I fit in the firsts, maybe the first jogger as a president or something like that. We've also had a lot of change in our industry, the issues of deregulation that have been mentioned by other speakers up here, Mr. Krebs last year, followed by Mr. Marcus' speech and Mr. White from the Milwaukee. We've heard a lot about deregulation. We are all probably dealing with somewhere between 15 and 25 percent less force than maybe three or four years ago. So there's been a big change and we can probably look forward to more in the future. But one thing standing out as constant while all this change is going on and that is the roadmasters, assistant roadmasters, track supervisors, general roadmasters on our railroads are the first line of defense, you might say, in the maintenance of way organization. They're still out there doing the job, and they will be doing it in the future, too. It's on those people that we often rely for our paychecks and keeping the railroad running safely. And I'd just like to say that in the future years to come, that I hope the Roadmasters continue to be of service to provide the information to the roadmasters and other railroad workers to help do their jobs better. I think that's a big challenge and I look forward to helping with that in the year ahead. We've a pretty good board, and we have a big show year ahead of us in Dallas. I look forward to seeing all of you down there. Thank you.

(Applause.)

President-Elect Williams: Thank you, Dave. I guess I'm going to get to use this (gavel). Members and guests, if there are no other matters to be brought before this session, I declare the 96th Annual Conference of the Roadmasters' and Maintenance of Way Association of America and the 89th Annual Conference of the American Railway Bridge and Building Association adjourned.

(Applause.)

Bottom row, left to right: D.J. Lewis, D.A. Bessey, J.M. Williams, J. Budzileni, J.T. Kapp, P.A. Weissmann. Top row, left to right: W.J. Semioli, D.R. Ladner, B.T. Burns, T.E. Kuhn, R.A. Tallent, W.P. Cunningham, J.J. Horney, J.H. Smith, D.T. Brookings.

Past Officers

	1891–1892	1892–1893	1893–1894	1894–1895
President	O. J. Travis	H. M. Hall	J. E. Wallace	Geo. W. Andrews
1st V.-Pres.	H. M. Hall	J. E. Wallace	Geo. W. Andrews	W. A. McGonagle
2nd V.-Pres.	J. B. Mitchell	G. W. Hinman	W. A. McGonagle	L. K. Spafford
3rd V.-Pres.	James Stannard	N. W. Thompson	L. K. Spafford	James Stannard
4th V.-Pres.	G. W. Hinman	C. T. Fuller	E. D. Hines	Walter G. Berg
Secretary	C. W. Gooch	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	George M. Reid	George M. Reid	George M. Reid	George M. Reid
Executive Members	W. R. Damon	G. W. Andrews	Q. McNab	James Stannard
	G. W. Markley	J. M. Staten	A. S. Markley	James H. Travis
	W. A. McGonagle	J. M. Caldwell	Floyd Ingram	J. H. Cummin
	C. W. McGehee	Q. McNab	James Stannard	R. M. Peck
	G. W. Turner	Floyd Ingram	James H. Travis	J. L. White
	J. E. Wallace	A. S. Markley	J. H. Cummin	A. Shane

	1895–1896	1896–1897	1897–1898	1898–1899
President	W. A. McGonagle	James Stannard	Walter G. Berg	J. M. Cummin
1st V.-Pres.	L. K. Spafford	Walter G. Berg	J. H. Cummin	A. S. Markley
2nd V.-Pres.	James Stannard	J. H. Cummin	A. S. Markley	C. C. Mallard
3rd V.-Pres.	Walter G. Berg	A. S. Markley	G. W. Hinman	W. A. Rogers
4th V.-Pres.	J. H. Cummin	R. M. Peck	C. C. Mallard	J. M. Staten
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	George M. Reid	N. W. Thompson	N. W. Thompson	N. W. Thompson
Executive Members	R. M. Peck	W. O. Eggleston	G. J. Bishop	Wm. S. Danes
	L. J. White	W. M. Noon	C. P. Austin	J. H. Markley
	A. Shane	J. M. Staten	M. Riney	W. O. Eggleston
	A. S. Markley	G. J. Bishop	Wm. S. Danes	R. L. Heflin
	W. M. Noon	C. P. Austin	J. H. Markley	F. W. Tanner
	J. M. Staten	M. Riney	W. O. Eggleston	A. Zimmerman

	1899–1900	1900–1901	1901–1902	1902–1903
President	Aaron S. Markley	W. A. Rogers	W. S. Danes	B. F. Pickering
1st V.-Pres.	W. A. Rogers	W. S. Danes	B. F. Pickering	C. C. Mallard
2nd V.-Pres.	J. M. Staten	B. G. Pickering	A. Shane	A. Shane
3rd V.-Pres.	Wm. S. Danes	A. Shane	A. Zimmerman	A. Zimmerman
4th V.-Pres.	B. F. Pickering	A. Zimmerman	C. C. Mallard	A. Montzheimer
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	N. W. Thompson	N. W. Thompson	N. W. Thompson	N. W. Thompson
Executive Members	T. M. Strain	T. M. Strain	A. Montzheimer	W. E. Smith
	R. L. Heflin	H. D. Cleaveland	W. E. Smith	A. W. Merrick
	F. W. Tanner	F. W. Tanner	A. W. Merrick	C. P. Austin
	A. Zimmerman	A. Montzheimer	C. P. Austin	C. A. Lichty
	H. D. Cleaveland	W. E. Smith	C. A. Lichty	W. O. Eggleston
	A. Montzheimer	A. W. Merrick	W. O. Eggleston	J. H. Markley

	1903–1904	1904–1905	1905–1906	1906–1907
President	A. Montzheimer	C. A. Lichty	J. B. Sheldon	J. H. Markley
1st V.-Pres.	A. Shane	J. B. Sheldon	J. H. Markley	R. H. Reid
2nd V.-Pres.	C. A. Lichty	J. H. Markley	R. H. Reid	J. P. Canty
3rd V.-Pres.	J. B. Sheldon	R. H. Reid	R. C. Sattley	H. Rettinghouse
4th V.-Pres.	J. H. Markley	R. C. Sattley	J. P. Canty	F. E. Schall
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	C. P. Austin	C. P. Austin	C. P. Austin	C. P. Austin
Executive Members	R. H. Reid	W. O. Eggleston	H. Rettinghouse	W. O. Eggleston
	W. O. Eggleston	A. E. Killam	A. E. Killam	A. E. Killam
	A. E. Killam	H. Rettinghouse	J. S. Lemond	J. S. Lemond
	R. C. Sattley	J. S. Lemond	C. W. Richey	C. W. Richey
	H. Rettinghouse	W. H. Finley	W. O. Eggleston	H. H. Eggleston
	J. S. Lemond	C. W. Richey	F. E. Schall	B. J. Sweatt

	1907–1908	1908–1909	1909–1910	1910–1911
President	R. H. Reid	J. P. Canty	H. Rettinghouse	H. Rettinghouse
1st V.-Pres.	J. P. Canty	H. Rettinghouse	J. S. Lemond	F. E. Schall
2nd V.-Pres.	H. Rettinghouse	F. E. Schall	F. E. Schall	A. E. Killam
3rd V.-Pres.	F. E. Schall	J. S. Lemond	A. E. Killam	J. N. Penwell
4th V.-Pres.	W. O. Eggleston	A. E. Killam	J. N. Penwell	L. D. Hadwen
Secretary	S. F. Patterson	S. F. Patterson	C. A. Lichty	C. A. Lichty
Treasurer	C. P. Austin	C. P. Austin	J. P. Canty	J. P. Canty
Executive Members	A. E. Killam	J. N. Penwell	W. Beahan	T. J. Fullem
	J. S. Lemond	Willard Beahan	F. B. Scheetz	G. Aldrich
	C. W. Richey	F. B. Scheetz	L. D. Hadwen	P. Swenson
	T. S. Leake	W. H. Finley	T. J. Fullem	G. W. Rear
	W. H. Finley	L. D. Hadwen	G. Aldrich	W. O. Eggleston
	J. N. Penwell	T. J. Fullem	P. Swenson	W. F. Steffens

	1911-1912	1912-1913	1913-1914	1914-1915
President	F. E. Schall	A. E. Killam	J. N. Penwell	L. D. Hadwen
1st V.-Pres.	A. E. Killam	J. N. Penwell	L. D. Hadwen	G. Aldrich
2nd V.-Pres.	J. N. Penwell	L. D. Hadwen	G. Aldrich	G. W. Rear
3rd V.-Pres.	L. D. Hadwen	T. J. Fullem	G. W. Rear	C. E. Smith
4th V.-Pres.	T. J. Fullen	G. Aldrich	C. E. Smith	E. B. Ashby
Secretary	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Treasurer	J. P. Canty	J. P. Canty	J. P. Canty	F. E. Weise
Executive Members	G. Aldrich	G. W. Rear	W. F. Steffens	W. F. Steffens
	P. Swenson	W. F. Steffens	E. B. Ashby	S. C. Tanner
	G. W. Rear	E. B. Ashby	S. C. Tanner	Lee Jutton
	W. F. Steffens	C. E. Smith	Lee Jutton	F. F. Strouse
	E. B. Ashby	S. C. Tanner	W. F. Strouse	C. R. Knowles
	W. O. Eggleston	Lee Jutton	C. R. Knowles	A. Ridgway

	1915-1916	1916-1917	1917-1918	1918-1919
President	G. W. Rear	C. E. Smith	S. C. Tanner	Lee Jutton
1st V.-Pres.	C. E. Smith	E. B. Ashby	Lee Jutton	F. E. Weise
2nd V.-Pres.	E. B. Ashby	S. C. Tanner	F. E. Weise	W. F. Strouse
3rd V.-Pres.	S. C. Tanner	Lee Jutton	W. F. Strouse	C. R. Knowles
4th V.-Pres.	Lee Jutton	F. E. Weise	C. R. Knowles	A. Ridgway
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Executive Members	F. E. Weise	W. F. Strouse	A. Ridgway	J. S. Robinson
	W. F. Strouse	C. R. Knowles	J. S. Robinson	J. P. Wood
	C. R. Knowles	A. Ridgway	J. P. Wood	A. B. McVay
	A. Ridgway	J. S. Robinson	D. C. Zook	J. H. Johnston
	J. S. Robinson	J. P. Wood	A. B. McVay	E. T. Howson
	J. P. Wood	D. C. Zook	J. H. Johnston	C. W. Wright

	1919-1920	1920-1921	1921-1922	1922-1923
President	F. E. Weise	W. F. Strouse	C. R. Knowles	Arthur Ridgway
1st V.-Pres.	W. F. Strouse	C. R. Knowles	A. Ridgway	J. P. Wood
2nd V.-Pres.	C. R. Knowles	A. Ridgway	J. S. Robinson	J. S. Robinson
3rd V.-Pres.	A. Ridgway	J. S. Robinson	J. P. Wood	C. W. Wright
4th V.-Pres.	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.			F. E. Weise	F. E. Weise
Directors	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
	A. B. McVay	A. B. McVay	J. H. Johnson	Maro Johnson
	J. H. Johnston	G. A. Manthey	E. K. Barrett	O. F. Dalstrom
	E. T. Howson	E. T. Howson	F. C. Baluss	S. D. Corey
	C. W. Wright	J. H. Johnston	Maro Johnson	W. B. Hotson
	G. A. Manthey	E. K. Barrett	O. F. Dalstrom	P. N. Nelson

	1923-1924	1924-1925	1925-1926	1926-1927
President	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
1st V.-Pres.	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
2nd V.-Pres.	C. W. Wright	E. T. Howson	F. C. Baluss	Maro Johnson
3rd V.-Pres.	E. T. Howson	F. C. Baluss	Maro Johnson	J. S. Huntoon
4th V.-Pres.	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.	F. E. Weise	F. E. Weise	F. E. Weise	F. E. Weise
Directors	S. T. Corey	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
	W. B. Hotson	A. I. Gauthier	W. B. Hotson	E. L. Sinclair
	P. N. Nelson	E. L. Sinclair	P. N. Nelson	P. F. Dalstrom
	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	W. T. Krausch
	A. I. Gauthier	W. B. Hotson	E. L. Sinclair	R. C. Bardwell
	E. L. Sinclair	P. N. Nelson	O. F. Dalstrom	H. I. Benjamin

	1927-1928	1928-1929	1929-1930	1930-1934
President	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
1st V.-Pres.	Maro Johnson	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
2nd V.-Pres.	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	H. I. Benjamin
3rd V.-Pres.	C. S. Heritage	A. I. Gauthier	H. I. Benjamin	W. T. Krausch
4th V.-Pres.	A. I. Gauthier	H. I. Benjamin	W. T. Krausch	T. H. Strate
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.	F. E. Weise	F. E. Weise		
Directors	W. T. Krausch	R. C. Henderson	G. A. Rodman	E. C. Neville
	R. C. Bardwell	J. S. Ekey	W. A. Batey	H. H. Best
	H. I. Benjamin	T. H. Strate	F. W. Hillman	J. E. King
	R. C. Henderson	G. A. Rodman	E. C. Neville	A. B. Scowden
	T. H. Strate	W. A. Batey	H. H. Best	W. A. Batey
	J. S. Ekey	F. W. Hillman	J. E. King	L. C. Smith

	1934–1935	1935–1936	1936–1937	1937–1938
President	H. I. Benjamin	T. H. Strate	E. C. Neville	C. M. Burpee
1st V.-Pres.	T. H. Strate	E. C. Neville	C. M. Burpee	F. H. Masters
2nd V.-Pres.	E. C. Neville	C. M. Burpee	F. H. Masters	W. S. Lacher
3rd V.-Pres.	A. B. Scowden	F. H. Masters	C. A. J. Richards	C. A. J. Richards
4th V.-Pres.	W. R. Roof	C. A. J. Richards	W. S. Lacher	F. H. Cramer
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Directors	C. M. Burpee	A. L. McCloy	W. R. Roof	B. R. Meyers
	W. A. Batey	R. P. Luck	T. P. Soule	G. S. Crites
	L. C. Smith	H. H. Best	F. H. Cramer	R. E. Dove
	C. A. J. Richards	W. R. Roof	B. R. Meyers	T. P. Soule
	A. L. McCloy	T. P. Soule	G. S. Crites	A. Chinn
	R. P. Luck	F. H. Cramer	R. E. Dove	L. G. Byrd

	1938–1939	1939–1940	1940–1941	1941–1942
President	Armstrong Chinn	A. E. Bechtelheimer	H. M. Church	R. E. Dove
1st V.-Pres.	F. H. Cramer	F. H. Cramer	R. E. Dove	F. H. Soothill
2nd V.-Pres.	A. E. Bechtelheimer	H. M. Church	F. A. Soothill	G. S. Crites
3rd V.-Pres.	H. M. Church	R. E. Dove	G. S. Crites	A. M. Knowles
4th V.-Pres.	R. E. Dove	F. H. Soothill	A. M. Knowles	N. D. Howard
Sec.-Treas.	C. A. Lichty	C. A. Lichty		
Secretary	. . . . .	. . . . .	F. O. Whiteman	A. G. Shaver
Treasurer	. . . . .	. . . . .	F. E. Weise	F. E. Weise
Directors	L. G. Byrd	B. R. Meyers	N. D. Howard	R. E. Caudle
	W. R. Ganser	W. Walkden	L. G. Byrd	I. A. Moore
	F. H. Soothill	A. S. Krefting	K. L. Miner	W. A. Sweet
	B. R. Meyers	A. M. Knowles	R. E. Caudle	J. L. Varker
	W. Walkden	L. G. Byrd	I. A. Moore	L. E. Peyser
	A. S. Krefting	K. L. Miner	W. A. Sweet	Martin Meyer

	1942–1943	1943–1944	1944–1945	1945–1946
President	G. S. Crites	J. L. Varker	J. L. Varker	N. D. Howard
1st V.-Pres.	R. E. Caudle	R. E. Caudle	R. E. Caudle	F. G. Campbell
2nd V.-Pres.	A. M. Knowles	N. D. Howard	N. D. Howard	J. S. Hancock
3rd V.-Pres.	N. D. Howard	F. G. Campbell	F. G. Campbell	E. H. Barnhart
4th V.-Pres.	J. L. Varker	J. S. Hancock	J. S. Hancock	W. F. Martens
Secretary	A. G. Shaver†	Elinor V. Heffern	Elise LaChance	Elise LaChance
	Lorene Kindred‡			
	Elinor V. Heffern			
Treasurer	F. E. Weise	C. R. Knowles	C. R. Knowles	C. R. Knowles
Treasurer Emeritus		F. E. Weise	F. E. Weise	
Directors	M. Meyer	W. F. Martens	W. F. Martens	A. B. Chapman
	L. E. Peyser	A. L. McCloy	A. L. McCloy	W. A. Huckstep
	K. L. Miner	L. C. Winkelhaus	L. C. Winkelhaus	F. R. Spofford
	F. G. Campbell	E. H. Barnhart	E. H. Barnhart	Guy E. Martin
	J. S. Hancock	A. B. Chapman	A. B. Chapman	B. R. Meyers
	L. C. Winkelhaus	L. E. Peyser	L. E. Peyser	L. E. Peyser

† To November 1, 1942 ‡ To February 1, 1943

	1946–1947	1947–1948	1948–1949	1949–1950
President	F. G. Campbell	J. S. Hancock	E. H. Barnhart	W. F. Martens
1st V.-Pres.	J. S. Hancock	E. H. Barnhart	W. F. Martens	W. A. Huckstep
2nd V.-Pres.	E. H. Barnhart	W. F. Martens	W. A. Huckstep	Guy E. Martin
3rd V.-Pres.	W. F. Martens	W. A. Huckstep	Guy E. Martin	F. R. Spofford
4th V.-Pres.	W. A. Huckstep	G. E. Martin	F. R. Spofford	Lee Mayfield
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	C. R. Knowles	C. R. Knowles	L. C. Winkelhaus	L. C. Winkelhaus
Directors	Guy E. Martin	H. M. Harlow	Lee Mayfield	H. M. Harlow
	B. R. Meyers	H. B. Christianson	F. M. Misch	V. E. Engman
	L. E. Peyser	F. R. Spofford	W. D. Gibson	G. W. Benson
	H. M. Harlow	Lee Mayfield	H. M. Harlow	F. M. Misch
	H. B. Christianson	Franz M. Misch	V. E. Engman	L. R. Morgan
	F. R. Spofford	W. D. Gibson	G. W. Benson	J. A. Jorlett

	1950–1951	1951–1952	1952–1953	1953–1954
President	W. A. Huckstep	Guy E. Martin	F. R. Spofford	Lee Mayfield
1st V.-Pres.	Guy E. Martin	F. R. Spofford	Lee Mayfield	H. M. Harlow
2nd V.-Pres.	F. R. Spofford	Lee Mayfield	H. M. Harlow	J. A. Jorlett
3rd V.-Pres.	Lee Mayfield	H. M. Harlow	J. A. Jorlett	R. R. Gunderson
4th V.-Pres.	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	F. M. Misch	M. H. Dick	W. H. Huffman	M. H. Dick
	L. R. Morgan	R. R. Gunderson	L. R. Morgan	J. F. Warrenfells
	J. A. Jorlett	J. F. Warrenfells	B. M. Stephens	G. Switzer
	M. H. Dick	W. H. Huffman	M. H. Dick	B. M. Stephens
	R. R. Gunderson	L. R. Morgan	J. F. Warrenfells	W. H. Bunge
	J. F. Warrenfells	B. M. Stephens	G. Switzer	E. R. Schlaf

	1954–1955	1955–1956	1956–1957	1957–1958
President	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
1st V.-Pres.	J. A. Jorlett	R. R. Gunderson	W. H. Huffman	M. H. Dick
2nd V.-Pres.	R. R. Gunderson	W. H. Huffman	M. H. Dick	B. M. Stephens
3rd V.-Pres.	W. H. Huffman	M. H. Dick	B. M. Stephens	H. D. Curie
4th V.-Pres.	M. H. Dick	B. M. Stephens	H. D. Curie	
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	B. M. Stephens	J. F. Warrenfells	W. H. Bunge	G. W. Benson
	W. H. Bunge	H. D. Curie	E. R. Schlaf	J. M. Lowry
	E. R. Schlaf	J. M. Lowry	G. W. Benson	H. H. Matthews
	J. F. Warrenfells	W. H. Bunge	J. M. Lowry	T. M. VonSprecken
	H. D. Curie	E. R. Schlaf	T. M. VonSprecken	W. H. Bunge
	J. M. Lowry	G. W. Benson	H. A. Matthews	E. R. Schlaf

	1958–1959	1959–1960	1960–1961	1961–1962
President	M. H. Dick	B. M. Stephens	H. D. Curie	G. W. Benson
1st V.-Pres.	B. M. Stephens	H. D. Curie	G. W. Benson	J. M. Lowry
2nd V.-Pres.	H. D. Curie	G. W. Benson	J. M. Lowry	E. R. Schlaf
3rd V.-Pres.	G. W. Benson	J. M. Lowry	E. R. Schlaf	H. A. Matthews
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	J. M. Lowry	W. H. Bunge	H. A. Matthews	R. C. Baker
	R. C. Baker	E. R. Schlaf	M. J. Hubbard	R. H. Miller
	W. H. Bunge	H. A. Matthews	R. C. Baker	Shirley White
	E. R. Schlaf	M. J. Hubbard	R. H. Miller	H. M. Wilson
	H. A. Matthews	R. C. Baker	Shirley White	R. D. Hellweg
	M. J. Hubbard	R. H. Miller	H. M. Wilson	F. W. Hutcheson

	1962–1963	1963–1964	1964–1965	1965–1966
President	J. M. Lowry	E. R. Schlaf	R. C. Baker	H. M. Wilson
1st V.-Pres.	E. R. Schlaf	R. C. Baker	H. M. Wilson	R. D. Hellweg
2nd V.-Pres.	H. A. Matthews	Shirley White	R. D. Hellweg	J. W. DeValle
3rd V.-Pres.	R. C. Baker	H. M. Wilson	J. W. DeValle	W. F. Armstrong
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	L. C. Winkelhaus	E. F. Snyder	E. F. Snyder	E. F. Snyder
Directors	Shirley White	R. D. Hellweg	W. F. Armstrong	J. A. Goforth
	H. M. Wilson	F. W. Hutcheson	J. S. Ellis	E. R. Simmons
	R. D. Hellweg	W. F. Armstrong	J. A. Goforth	N. D. Bryant
	F. W. Hutcheson	J. W. DeValle	E. R. Simmons	A. R. Dahlberg
	W. F. Armstrong	J. A. Goforth	N. D. Bryant	J. S. Ellis
	J. W. DeValle	E. R. Simmons	A. R. Dahlberg	T. L. Fuller

	1966–1967	1967–1968	1968–1969	1969–1970
President	R. D. Hellweg	J. W. DeValle	W. F. Armstrong	J. A. Goforth
1st V.-Pres.	J. W. DeValle	W. F. Armstrong	J. A. Goforth	A. R. Dahlberg
2nd V.-Pres.	W. F. Armstrong	J. A. Goforth	A. R. Dahlberg	T. L. Fuller
3rd V.-Pres.	J. A. Goforth	A. R. Dahlberg	T. L. Fuller	N. D. Bryant
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	W. H. Huffman	W. H. Huffman	W. H. Huffman	W. H. Huffman
Directors	N. D. Bryant	J. S. Ellis	N. F. Lucas	W. H. Rankin
	A. R. Dahlberg	T. L. Fuller	W. L. Short	E. E. Runde
	H. F. Lucas	R. A. Youngblood	C. E. Wachter	T. A. Reynolds
	J. S. Ellis	H. F. Lucas	A. C. Jones	J. J. Ridgeway
	T. L. Fuller	W. L. Short	W. H. Rankin	J. R. Williams
	R. A. Youngblood	C. E. Wachter	E. E. Runde	J. W. Chambers
	V. D. Raessler	A. C. Jones	T. A. Reynolds	R. E. Frame
	W. L. Short	W. H. Rankin	J. J. Ridgeway	J. C. Hobbs
	C. E. Wachter	E. E. Runde	J. R. Williams	

	1970–1971	1971–1972	1972–1973	1973–1974
President	A. R. Dahlberg	T. L. Fuller	N. D. Bryant	E. E. Runde
1st V.-Pres.	T. L. Fuller	N. D. Bryant	E. E. Runde	J. J. Ridgeway
2nd V.-Pres.	N. D. Bryant	E. E. Runde	J. J. Ridgeway	J. R. Williams
3rd V.-Pres.	E. E. Runde	J. J. Ridgeway	J. R. Williams	W. R. Rankin
Secretary	Ann Wilson	Ann Wilson	Ann Wilson	Ann Wilson
Treasurer	W. H. Huffman	W. H. Huffman	W. H. Huffman	W. H. Huffman
Directors	T. A. Reynolds	J. W. Chambers	R. K. Corbett	D. C. Gould
	J. J. Ridgeway	R. E. Frame	J. R. Iwinski	W. S. Stokely
	J. R. Williams	J. C. Hobbs	J. S. Pritchett	W. C. Sturm
	J. W. Chambers	R. K. Corbett	D. C. Gould	J. W. Davidson
	R. E. Frame	J. R. Iwinski	W. S. Stokely	C. A. Hughes
	J. C. Hobbs	J. S. Pritchett	W. C. Sturm	W. R. Hyma
	R. K. Corbett	D. C. Gould	J. W. Davidson	O. C. Denz
	J. R. Iwinsky	W. S. Stokely	C. A. Hughes	R. C. McMaster
	J. S. Pritchett	W. C. Sturm	W. R. Hyma	W. E. Brakensiek

	1974–1975	1975–1976	1976–1977	1977–1978
President	J. J. Ridgeway	J. R. Williams	W. H. Rankin	J. R. Iwinski
1st V.-Pres.	J. R. Williams	W. H. Rankin	J. R. Iwinski	W. C. Sturm
2nd V.-Pres.	W. H. Rankin	J. C. Hobbs	W. C. Sturm	D. C. Gould
3rd V.-Pres.	J. C. Hobbs	J. R. Iwinski	D. C. Gould	J. W. Chambers
Secretary	Ann Wilson	Ann Wilson	Ann Wilson	Ann Wilson
Treasurer	W. H. Huffman	W. H. Huffman	W. H. Huffman	W. H. Huffman
Directors	J. W. Davidson	W. E. Brakensiek	J. W. Chambers	W. J. Gunkle
	C. A. Hughes	O. C. Denz	M. Noyszewski	W. E. Halley
	W. R. Hyma	R. C. McMaster	W. J. Gunkle	K. L. Wammell
	W. E. Brakensiek	F. R. Lindsay	W. E. Halley	J. Budzileni
	O. C. Denz	M. Noyszewski	K. L. Wammel	B. J. King
	R. C. McMaster	W. C. Sturm	J. Budzileni	J. G. Robertson
	F. B. Lindsay, Jr.	W. J. Gunkle	B. J. King	O. C. Denz
	M. Noyszewski	W. E. Halley	J. G. Robertson	E. C. Patterson
	Jim Payne	K. L. Wammel		W. S. Stokely

	1978–1979	1979–1980	1980–1981	1981–1982
President	W. C. Sturm	D. C. Gould	J. W. Chambers	W. R. Hyma
Sr. V.-Pres.	D. C. Gould	J. W. Chambers	R. C. McMaster	O. C. Denz
Jr. V.-Pres.	J. W. Chambers	R. C. McMaster	W. R. Hyma	J. Budzileni
Jr. V.-Pres.	R. C. McMaster	W. R. Hyma	O. C. Denz	J. M. Williams
Secretary	Ann Wilson	Ann Wilson	Ann Wilson	Pat Weissmann
Treasurer	W. F. Armstrong	W. F. Armstrong	W. F. Armstrong	W. C. Sturm
Directors	J. Budzileni	O. C. Denz	J. W. Davidson	D. A. Bessey
	B. J. King	W. J. Gunkle	C. M. Russell	J. N. Michel
	J. G. Robertson	W. S. Stokely	J. M. Williams	P. H. Saletnik
	O. C. Denz	L. D. Green	D. A. Bessey	O. D. Anthony
	E. C. Patterson	C. M. Russell	J. N. Michel	J. T. Kapp
	W. S. Stokely	J. M. Williams	P. H. Saletnik	D. J. Lewis
	L. D. Green	D. A. Bessey	O. D. Anthony	J. W. Davidson
	C. M. Russell	J. N. Michel	J. T. Kapp	H. J. Laga
	J. M. Williams	P. H. Saletnik	D. J. Lewis	A. S. Uppal

	1982–1983	1983-1984
President	O. C. Denz	J. Budzileni
Sr. Vice President	J. Budzileni	J.M. Williams
Jr. Vice President	J. M. Williams	D.A. Bessey
Jr. Vice President	D. A. Bessey	J.T. Kapp
Secretary	P. A. Weissmann	P.A. Weissmann
Treasurer	P. H. Saletnik	P.H. Saletnik
Directors	O. D. Anthony	J.W. Davidson
	J. T. Kapp	D.J. Lewis
	D. J. Lewis	T.E. Kuhn
	J. W. Davidson	D.R. Ladner
	H. J. Laga	R.A. Tallent
	A. S. Uppal	B.T. Burns
	T. E. Kuhn	J.J. Horney
	D. R. Ladner	W.J. Semioli
	R. A. Tallent	D.W. Brookings
		W.P. Cunningham
		J.H. Smith

CONSTITUTION

ARTICLE I.

NAME

Section 1. This association shall be known as the American Railway Bridge & Building Association.

ARTICLE II.

OBJECT

Section 1.** The object of this association shall be the advancement of knowledge pertaining to the design, construction and maintenance of railway bridges, buildings, water service facilities, and other structures, by investigation, reports and discussions.

Section 2. The association shall neither endorse nor recommend any particular devices, trade marks or materials, nor will it be responsible for any opinions expressed in papers, reports or discussion unless the same have received the endorsement of the association in regular session.

ARTICLE III.

MEMBERSHIP

Section 1.* The membership of this association shall be divided into four classes, viz: Members, life members, associate members and honorary members.

Section 2.* A member shall be a person in a position above rank of gang foreman in connection with engineering, construction and maintenance for railway bridges, buildings and water service facilities: or in the employ of a public regulatory body, a professor of engineering or architecture, a technical editor, a government or private timber expert, a consulting engineer, or an engineer in his employ, engaged in the engineering, construction and maintenance of railroad-related facilities or an engineer employed by a technical service or research and development organization, an officer or engineer of an engineering or scientific society or association whose aims and objectives are compatible with the aims and objectives of this association. Any person desirous of becoming a member shall make application upon the form prescribed by the executive committee, setting forth his name, age, residence and practical experience. He shall furnish at least three references to whom he is personally known. Applicants may be voted into membership at any regular executive meeting or by letter ballot of the executive committee, a majority vote being necessary in either instance.

Section 3.** To be eligible for a life membership a member must have belonged to the association for at least 15†† years and in general must have retired from active railway service due to age or physical disability. He shall have all the privileges of membership, except the holding of office, and shall not be required to pay annual dues. The transfer from membership to life membership shall be made in the same manner as the election of members, as prescribed in Section 2, of this Article.

Section 4. Associates shall be responsible persons who are not eligible as members, whose pursuits or attainments qualify them to co-operate with members in the study and development of improved practices in the construction and maintenance of bridges, buildings and water facilities. They shall have all the rights of members except of voting and holding office. They shall be elected in the manner prescribed for members, in Section 2 of this Article.

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*Amended September, 1976.
**Amended September 20, 1948
††Amended March 10, 1958.

Section 5. Honorary members shall be chosen from persons who have attained acknowledged eminence in some branch of engineering or railway service. Their number shall be limited to ten. Honorary members shall be proposed by not less than six active members and shall be elected by the unanimous vote of the members present at a regular meeting. They shall have all the rights of members except that of holding office and shall be exempt from the payment of dues.

Section 6. Any member guilty of conduct unbecoming to a railroad officer and a member of this association, or who shall refuse to comply with the rules of this association, shall forfeit his membership on a two-thirds vote of the executive committee.

Section 7. Membership shall continue until written resignation is received by the secretary, unless member has been previously expelled, or dropped for non-payment of dues in accordance with Section 1 of Article VII.

Section 8.** Only members shall hold office in this association, and only members and life members shall be entitled to vote in the election of officers.

ARTICLE IV.

OFFICERS

Section 1‡‡. The officers of the Association shall be a President, two Junior Vice Presidents, a Senior Vice President, a Treasurer and nine Directors, who, with the most recent Past President, shall constitute the Executive Committee.

Section 2. The past presidents of this association, previous to the most recent past president, who continue to be members shall be privileged to attend all meetings of the executive committee, of which meetings they shall receive due notice, and be permitted to discuss all questions and to aid said committee by their advice and counsel; but said past presidents shall not have a right to vote, unless called upon to fill a quorum.

Section 3. Vacancies in any office shall be filled for the unexpired term by the executive committee without delay.

ARTICLE V.

EXECUTIVE COMMITTEE

Section 1.** The executive committee shall manage the affairs of the association and shall have full power to control and regulate all matters not otherwise provided for in the constitution and by-laws and shall exercise general supervision over the financial interests of the association, and make all necessary purchases and contracts required to conduct the general business of the association, but shall not have the power to render the association liable for any debt beyond the amount then in the treasury plus accounts receivable and not subject to other prior liabilities. All appropriations for special purposes must be acted upon at a regular meeting of the association.

Section 2. Meetings of the executive committee may be called by a majority of the members of the committee, providing 10 days' notice is given members by mail.

Section 3. Five members of the executive committee shall constitute a quorum for the transaction of business.

ARTICLE VI.

ELECTION OF OFFICERS AND SECRETARY AND TENURE OF OFFICE

Section 1. Except as otherwise provided the officers shall be elected at the regular annual meeting of the association and the election shall not be postponed except by unanimous consent of the members present at said annual meeting. The election shall be by ballot, a majority of the votes cast being required for election. Any member of the

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*Amended October 16, 1941.
†Amended September 21, 1957.
‡Amended September 28, 1966.
‡‡Amended September 20, 1978.
°Amended October 7, 1982.

association not in arrears for dues shall be eligible for office, but the president shall not be eligible for re-election.

Section 2††. The President, two Junior Vice Presidents, and Treasurer shall hold office for one year and the Directors for three years; three Directors being elected each year. The Senior Vice President shall hold office for one year and ascend to the office of President at the expiration of such service. All officers shall retain their office until their successors are elected and installed. A Director elected for a three-year term shall not be eligible to serve two consecutive terms.

Section 3.° The term of office of the treasurer may be terminated at any time by two-thirds vote of Executive Committee. The compensation of the treasurer shall be fixed by a majority vote of the Executive Committee.

Section 4.° The secretary shall be appointed by a majority vote of the Executive Committee and the term shall terminate with the appointment of successor. The Executive Committee shall have the power, by two-thirds vote, to remove the secretary and appoint successor at any time. The salary of the secretary shall be decided by a majority vote of the Executive Committee.

Section 5.° The secretary and the treasurer shall be required to give bond in an amount to be fixed by the Executive Committee.

ARTICLE VII.

MEMBERSHIP FEE AND DUES

Section 1†. Every member upon joining this association shall pay to the secretary an entrance fee and dues as prescribed by the executive committee. No member in arrears for annual dues shall be entitled to vote at any election and any member more than one year in arrears, may be stricken from the list of members at the discretion of the executive committee.

Section 2.‡ A person stricken from the list of members because of non-payment of dues, upon written application may be reinstated as a member in his former class without loss of privileges, either upon payment of all back dues (which must accompany applications) or at the discretion of the executive committee voting in the manner prescribed in Section 2, Article III.

ARTICLE VIII.*

LOCAL SECTIONS

Section 1.** Upon the application of ten or more members of the association residing in the same geographical district, or having offices therein, the executive committee shall organize a local section for that district, to which all members in that district shall be eligible. Such local section shall admit to active membership only members in good standing. It shall hold not less than two meetings each year, and shall be governed by such constitution and by-laws not inconsistent with the constitution of this association as the section membership may adopt and the executive committee approve.

Section 2. The parent association shall not be put under any obligation, either financial or in the matter of policy or opinion, by any local section.

ARTICLE IX.

AMENDMENTS

Section 1. This constitution may be amended at any regular meeting by a two-thirds vote of the members present, provided that notice of the proposed amendment or amendments has been sent to the members at least 30 days previous to said regular meeting.

By-Laws

TIME OF MEETING

1.** The regular meeting of this association shall convene annually during the month of September, the exact date to be fixed by the executive committee.

PLACE OF MEETING

2.** The place of holding the annual convention shall be Chicago, Ill.

3. It shall be within the power of the executive committee to change the location or time of the meeting if it becomes apparent that it is for the best interests of the association.

QUORUM

4. At the regular meeting of the association, 15 or more members shall constitute a quorum.

***DUES

5. The annual dues for the fiscal year ending August 31, and payable in advance, shall be as follows:°

Members, $20.00; Associate Members, $20.00.§

DUTIES OF OFFICERS

6.† The president shall have general supervision over the affairs of the association. He shall preside at all meetings of the association and of the executive committee; shall appoint all committees not otherwise provided for, and shall be ex-officio member of all committees. He shall with the secretary sign all contracts or other written obligations of the association which have been approved by the executive committee. He shall render a detailed report at least three times during the year to the members of the executive committee, showing the financial condition of the association and its activities.

At the annual meeting the president shall present a report containing a statement of the general conditions of the association.

7.‡‡ The Vice-Presidents in order of seniority shall preside at meetings in the absence of the President and discharge his duties in case of a vacancy in his office. The Senior Vice President shall have the senior position of Vice Presidents.

8.† It shall be the duty of the secretary to keep a correct record of the proceedings of all meetings of this association, and of all accounts, between this association and its members; to collect all moneys due the association, and deposit the same in the name of the association. He shall pay all bills when properly certified and approved by the president and the treasurer, and make such reports as may be called for by the executive committee. He shall also perform such other duties as the association may require.

9.‡ The treasurer shall have charge of the funds, check all deposits as made by the secretary, sign all checks after they have been approved by the president, and invest all funds not needed for current expenses as directed by the executive committee. He shall report at each annual meeting on the condition of the finances.

NOMINATING COMMITTEE

10.# After each annual meeting the president shall appoint a committee consisting of five members. Two Past Presidents shall be members of this committee, one of whom shall act as Chairman. No other officers of the Association shall be appointed to this committee. This committee shall prepare a list of names of nominees for officers to be voted on at the next annual convention in accordance with ARTICLE VI of the Constitution, said list to be read at the business session of said convention. Nothing in this section shall be construed to prevent any member making further nominations provided that such nominations are received by the President in writing not less than thirty (30) days in advance of the first day of the annual meeting. Such nominations should be addressed to the President of the Association at its headquarters office.

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‡Adopted October 17, 1940.
#Amended March 23, 1983.
†Amended September 20, 1948.
‡Amended September 21, 1957.
‡‡Amended September 20, 1978.

AUDITING COMMITTEE

11.‡ Prior to each annual meeting the president shall appoint a committee of three members, not officers of the association, whose duty it shall be to examine the accounts and vouchers of the secretary and the treasurer and certify as to the correctness of their accounts.

COMMITTEE ON SUBJECTS FOR DISCUSSION

12. After each annual meeting the president shall appoint a committee whose duty it shall be to prepare a list of subjects for investigation to be submitted for approval at the next convention.

COMMITTEE ON INVESTIGATION

13. After the association has adopted the list of subjects for investigation the president for the succeeding year shall appoint the committees who shall prepare the subjects for report and discussion. He may also appoint individual members to prepare reports on special subjects, or to report on any special or particular subject.

PUBLICATION COMMITTEE

14. After each annual meeting the executive committee shall appoint a publication committee consisting of three active members whose duty it shall be to cooperate with the secretary in the issuing of the publications of the association. The assignment of this committee shall be such that at least one member shall have served on the committee during the previous year.

ORDERS OF BUSINESS

15.† Call to order by president.
Opening prayer or invocation.
President's address.
Report of secretary.
Report of treasurer.
Appointment of special committees.
Reports of standing committees and presentation of papers.
Unfinished business.
New business.
Election of officers.
Installation of officers.
Adjournment.

DECISIONS

16. The votes of a majority of the members present shall decide any questions, motion or resolution which shall be brought before the association, unless otherwise provided. Unless specifically provided herein otherwise, all discussions shall be governed by Robert's rules of order.

AMENDMENTS

17.† The By-Laws can be amended by a two-thirds vote of those present at any regularly called executive committee meeting.

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†Amended September 20, 1948.
*Article adopted 1922.
**Amended September 20, 1948.
‡Amended September 21, 1957.
***Amended September 15, 1965.
§Amended June 8, 1984

ALPHABETICAL LIST OF ALL MEMBERS

M Indicates Member
A Indicates Associate Member
L Indicates Life Member
H Indicates Honorary Member

(Figures following name indicate year in which membership became effective)

A

Abbott, E.L. (A'69), Sales Engr
General Railway Signal Co.
2120 Prudential Plaza, Chgo, IL.60601

Adams, D.A. (M'84), B&B Supvr, MP
Coffeyville, KS 67337

Anderson, B. (M'82), Supvr Strs, Conrail
Columbus, OH 43229

Anderson, D.A. (M'80), Supvr B&B, DM&IR
Proctor, MN 55810

Anderson, H.E. (A'74), Mgr Opers.
Osmose Company-P.O. Box 8276
Madison, Wi. 53708

Anderson, T.C. (M'83), Des & Constr Mgr
Schnabel Foundation
Cary, IL 60013

Anderzunas, P.P. (M'84), Asst Div Engr,
B&B, C&S, Conrail, Mt. Holly, NJ 08060

Andrews, D.J. (M'69), B&B Supvr,C&NW
Menomonee Falls, WI. 53051

Anthony, O.D.(M'71), Asst Ch Engr
B&A- Bangor, ME 04401

Armenta, C.G.(M'82), Asst Gen Fore,AT&SF
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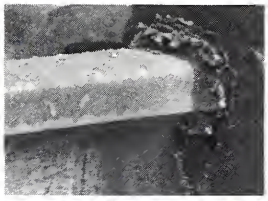

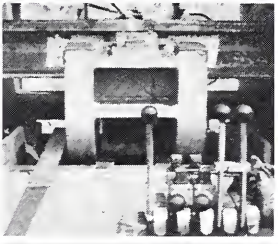

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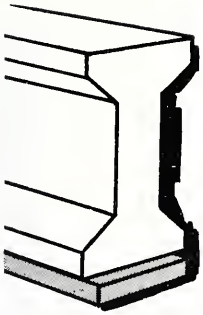

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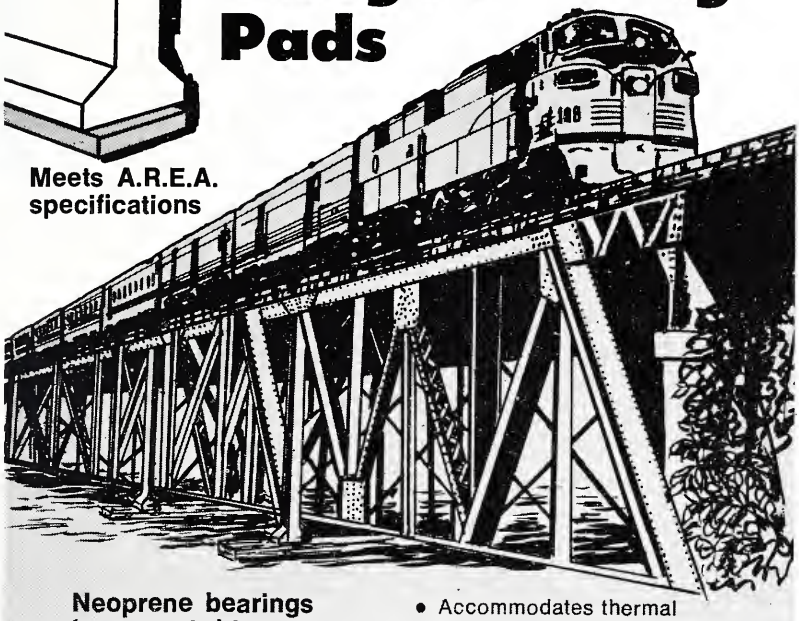

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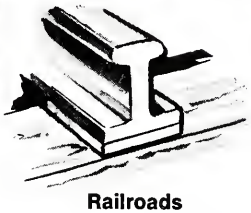

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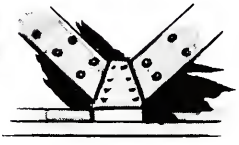

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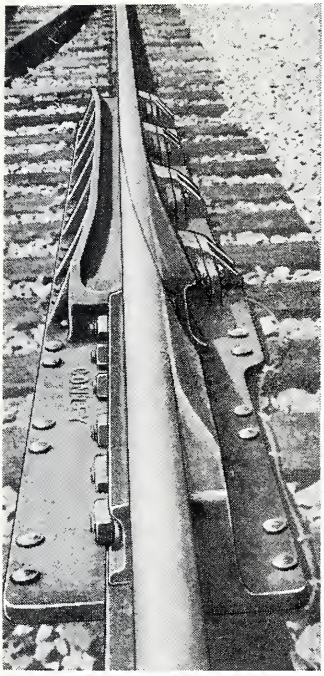

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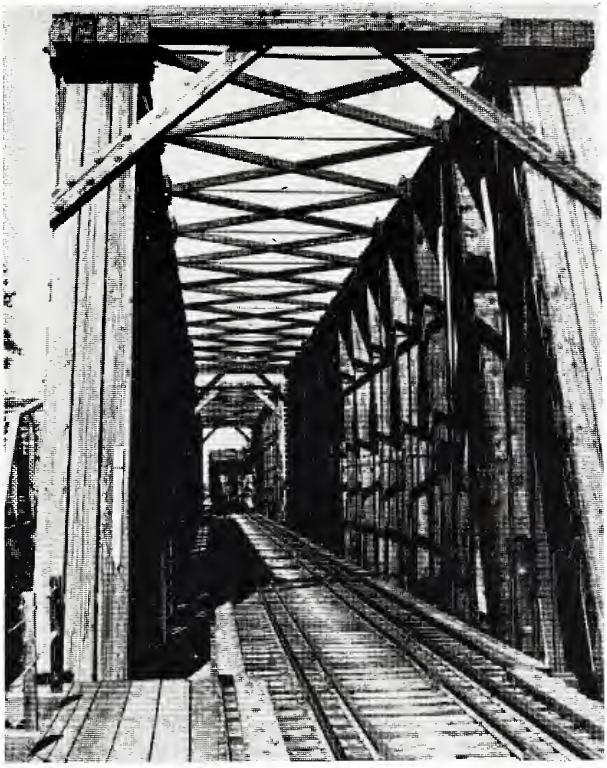

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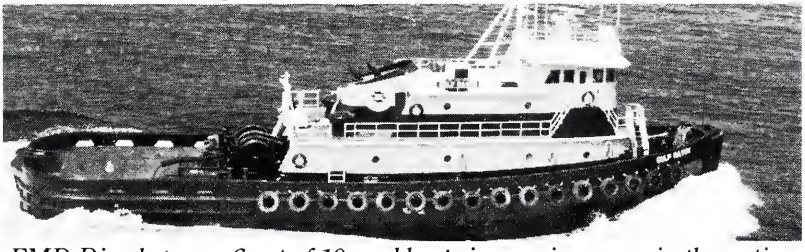

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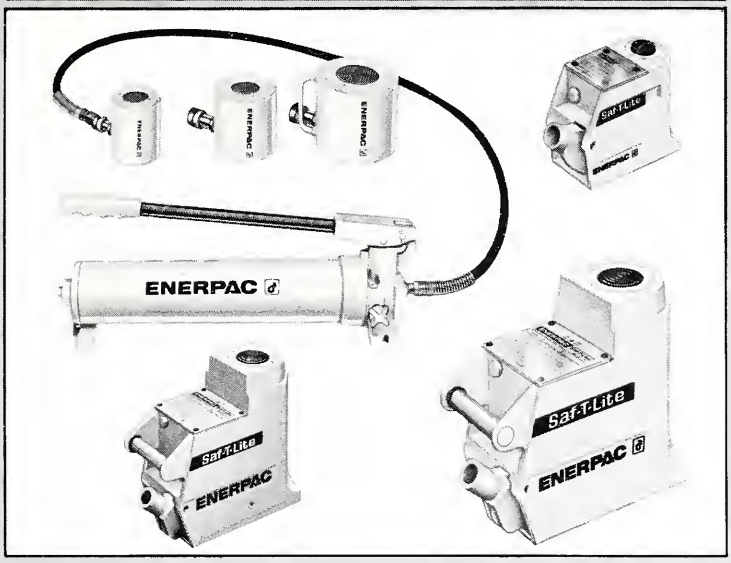

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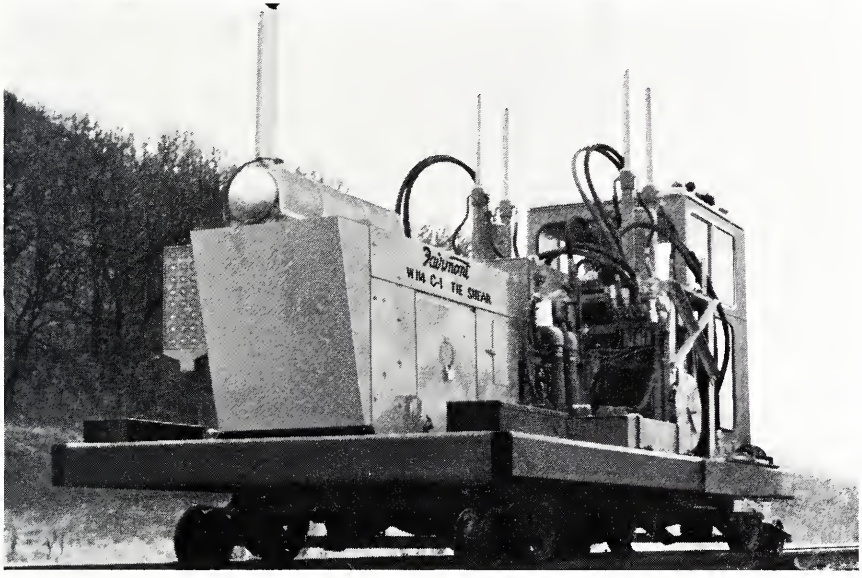

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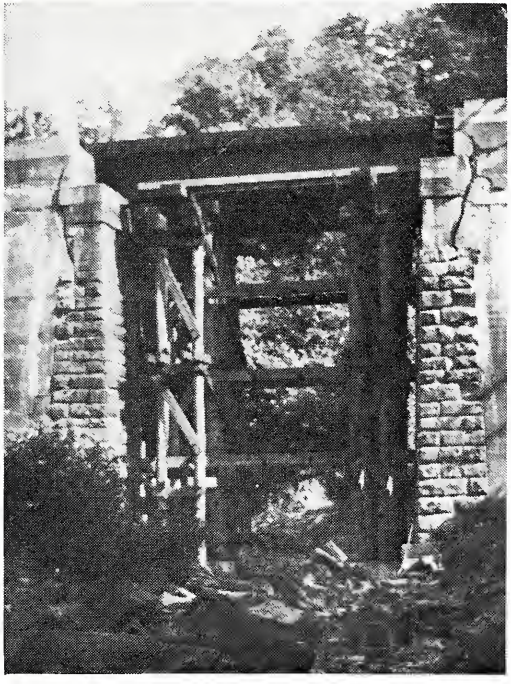

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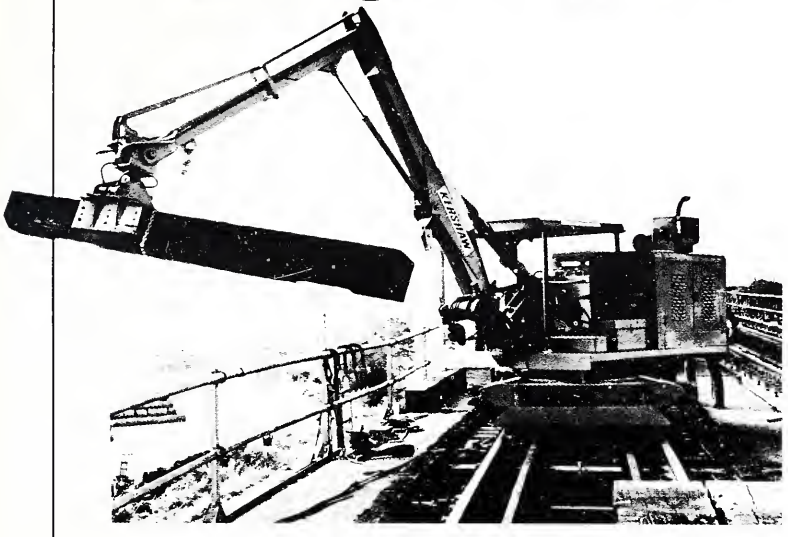

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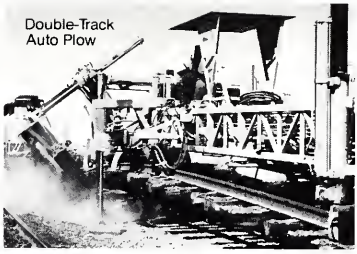
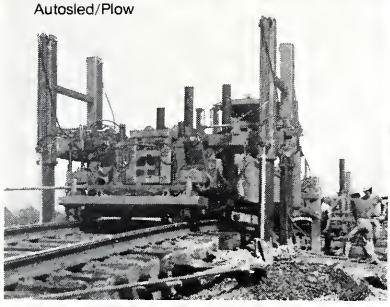

Double-Track Auto Plow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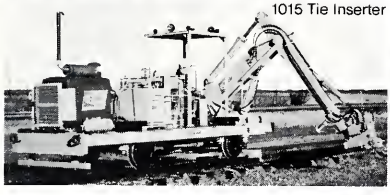
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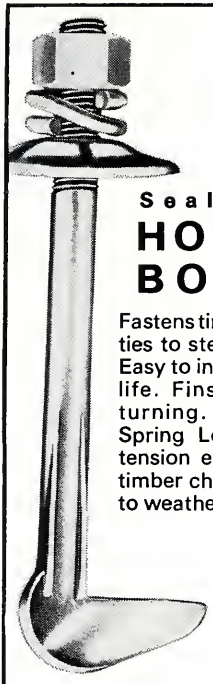

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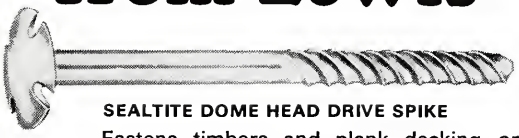

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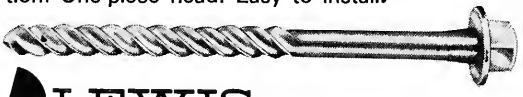

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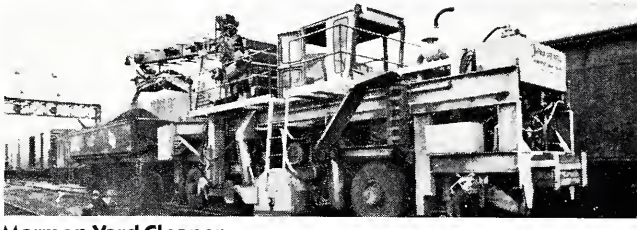

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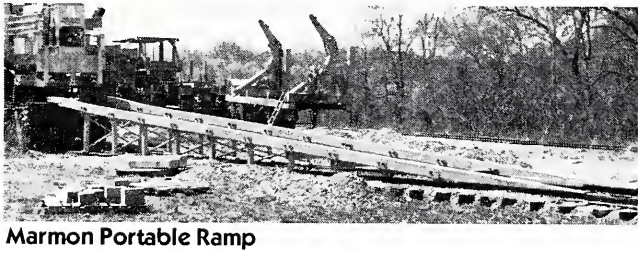

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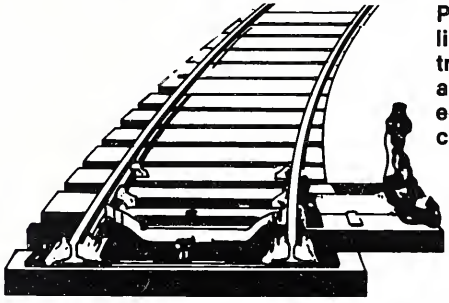

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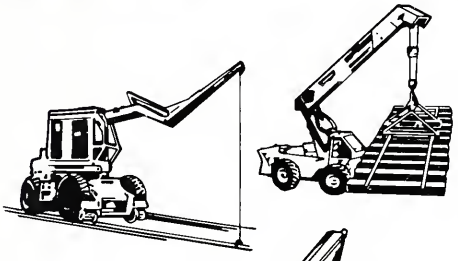

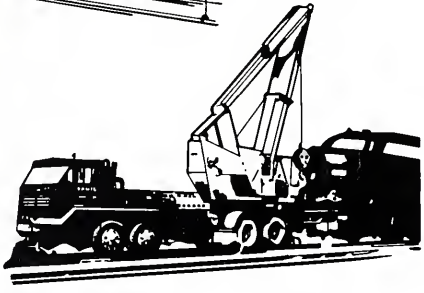

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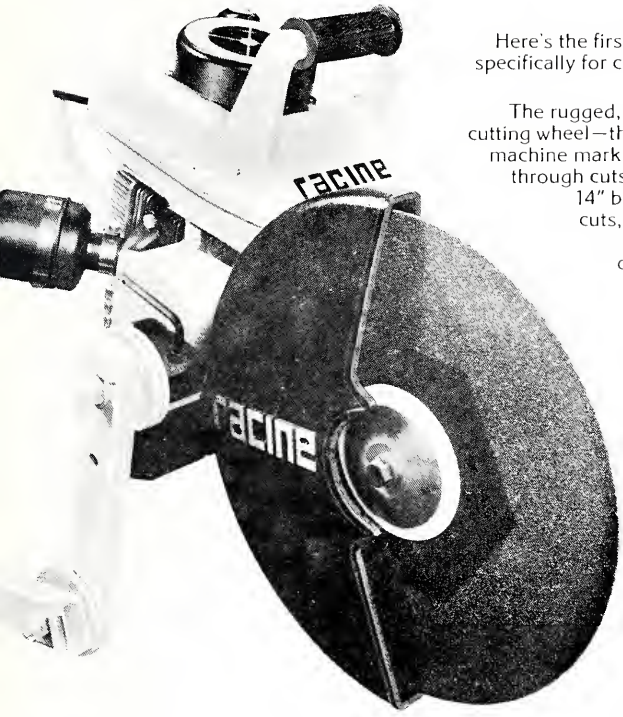

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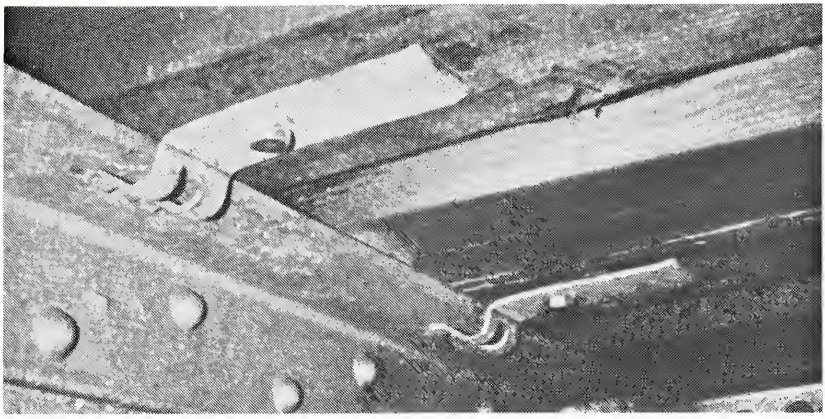

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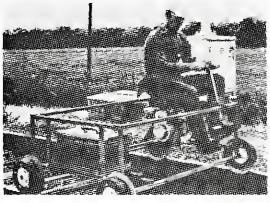

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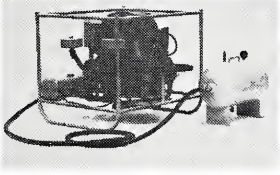

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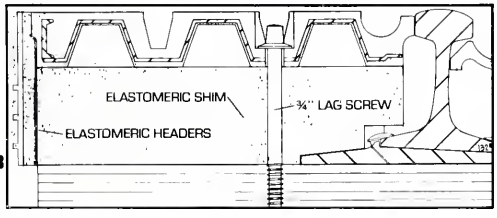

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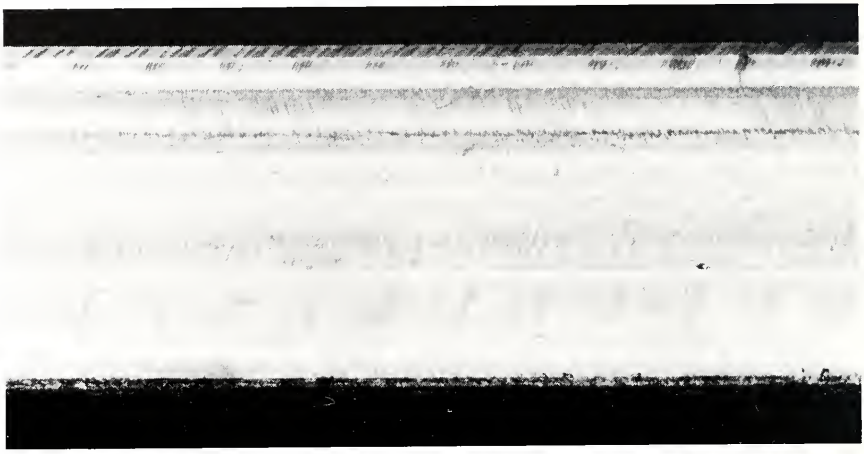

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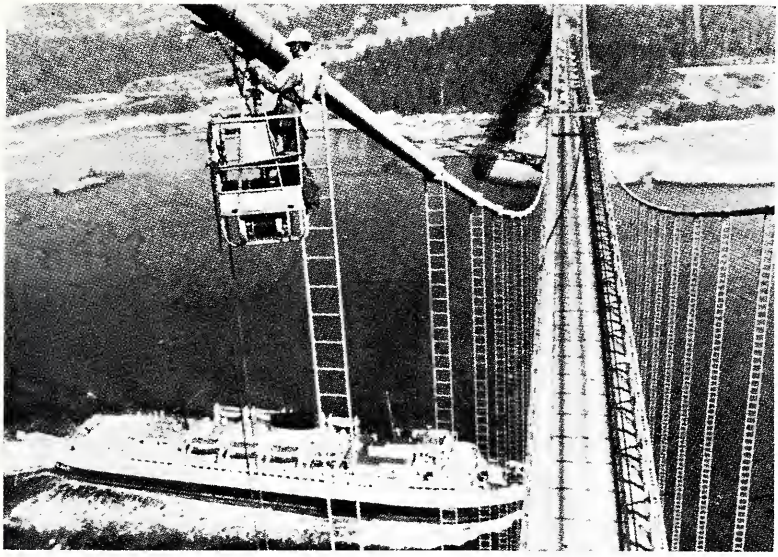
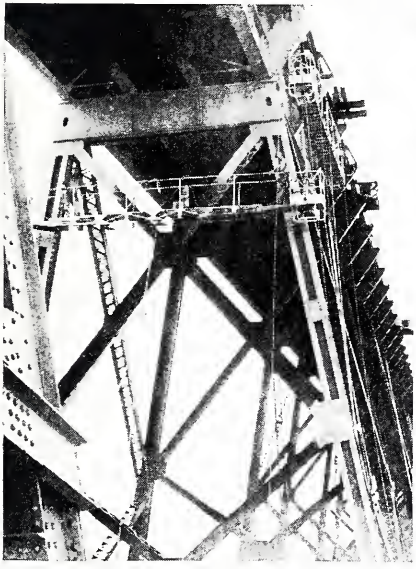


RIDING HIGH—Painter operates his Spider horizontally and vertically along cable of Lions Gate Bridge, Vancouver, B. C.



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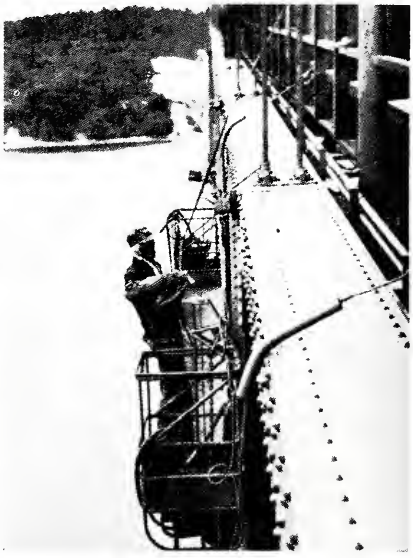

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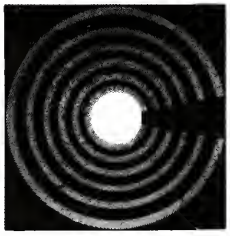

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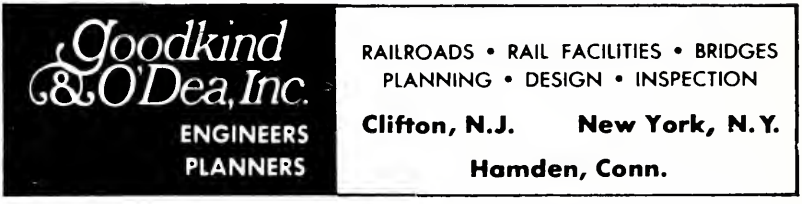
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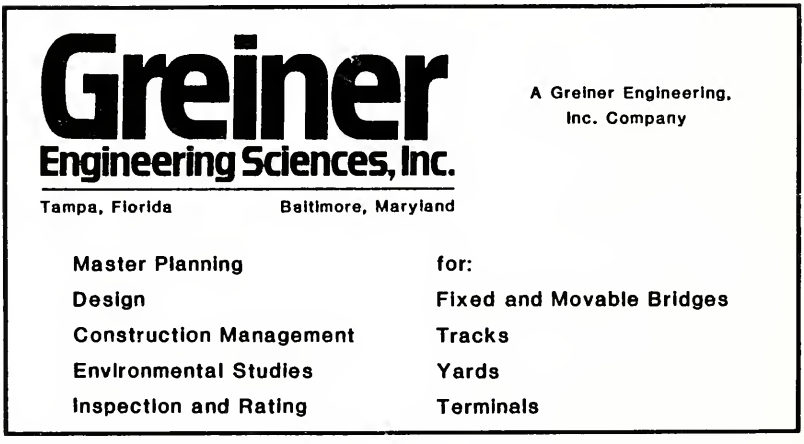
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Recycling Old Buildings (J. A. Campbell, Chairman)